THE BRITISH VETERINARY JOURNAL

EDITORS:
SIR THOMAS DALLING, *M.A., M.R.C.V.S., F.R.S.E.*
J. McCUNN, *M.R.C.V.S., L.R.C.P.*

Vol. 107 **March, 1951** **No. 3**

EDITORIAL

CONTROL OF DISEASE

ALL countries have their own methods of controlling diseases which are endemic and they apply measures to prevent the introduction of new diseases and to eradicate them, should they gain an entrance. As research workers produce results which lead to the development of better control measures, policies may have to be changed in order that more satisfactory procedures may be adopted. The importation of live animals must, however, always be attended by a certain amount of risk, however small, and adequate quarantine arrangements are important in all countries. The outstanding example of the value of quarantine measures in this country is the freedom of the country from rabies. Experience has shown that by quarantine alone it has been possible to prevent the introduction of that disease: the few rabid dogs in Great Britain in recent years have all been found in quarantine premises. Few livestock are ever introduced into this country: the conditions of quarantine on arrival in the country has proved successful in eliminating any chance of the introduction of exotic disease.

Infections can be carried by meat and meat products and there is always a risk of the occurrence of certain diseases following the distribution of such raw materials. Regulations for the boiling of refuse from meat are in existence and should go a long way to prevent contact between livestock and raw, imported meat. The faithful compliance with such regulations is undoubtedly responsible for the spread of some infections and livestock owners are much alive to the dangers which might arise should they fail to carry them out. Early reporting of the occurrence of infections, e.g., foot-and-mouth disease, swine fever, fowl pest, etc., or of suspicious cases has certainly led to the adoption of early

XUM

measures of control with resultant lack of spread and the early removal of irksome restrictions which form part of these measures. In this country there is much evidence of the part that livestock owners play in the control of these diseases by their anxiety to draw attention to suspicious outbreaks of disease. It must be the aim of all countries to prevent the introduction of exotic disease and to stamp it out before it becomes endemic. Drastic measures are often necessary but time has shown their value.

In countries in which an infection becomes endemic other methods of control may be necessary. It may not be possible to eradicate the infection, although the aim should be ultimate eradication: less drastic measures than slaughter alone may have to be introduced. The use of biological agents of good immunising value has an important place in the control of some diseases. Such products, however, must be of proved standard from an immunising point of view. At the present time, so far as biological products for use on livestock are concerned, standards may be applied on a national basis, but they are not yet recognised internationally. There would appear to be a definite need for the laying down and application of international standards. We are aware that this need is recognised by workers in many countries and we believe that it is only a question of time before standards will be available for international use. With the tendency to-day to import biological products from different sources of origin there can be no doubt not only of the desirability of recognised standards, but actually of the necessity for their existence and recognition. It is hoped that the various international organisations now in existence will combine efforts in the direction of formulating the necessary standards and influencing countries to accept and apply them.

GENERAL ARTICLES

TWO CASES OF AN ATYPICAL ARRANGEMENT OF THE CAUDAL VENA CAVA IN THE CAT

By W. C. D. HARE, B.Sc., M.R.C.V.S.,
Department of Anatomy, Royal (Dick) Veterinary College, Edinburgh.

WHILE carrying out research work on the lymphatic system in the cat, W. R. Duberley, a student of this College, brought to my notice the fact that in two of the cats which he had dissected the arrangement of the post-renal part of the caudal vena cava was atypical.

Description

Case I.—Adult Male Cat.

I can do no better than to quote from the very adequate description of the case prepared by Duberley: "The common iliac veins on each side were formed in the normal manner; they were continued cranially, one on either side of the aorta, and finally united in the inter-renal region.

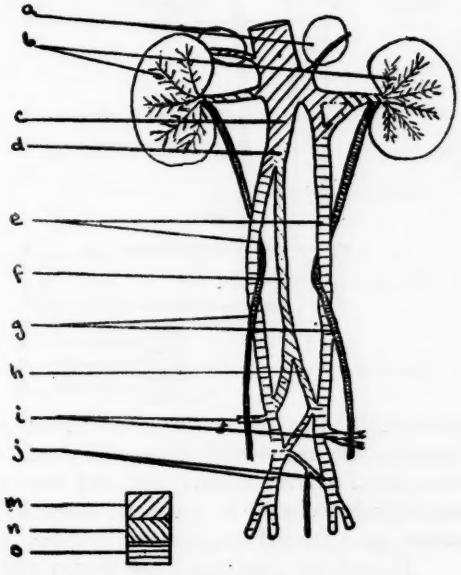


FIG. 1A.

Diagram to show the arrangement and origin of the veins in Case I.

(a) Adrenal glands. (b) Kidneys. (c) Inter-subcardinal anastomosis. (d) Anastomosis between right para-ureteric vein and inter-subcardinal anastomosis. (e) Lateral trunks. (f) Dorsal trunk. (g) Ureters. (h) Branch from left lateral trunk to the dorsal trunk. (i) Deep circumflex iliac veins. (j) Common iliac veins. (m) Subcardinal origin. (n) Para-ureteric origin. (o) Posterior cardinal origin.

"There were several anastomotic branches running between these two vessels which passed dorsally to the aorta on the level of the last two lumbar vertebræ, and the middle sacral vein flowed into the most posterior of these.

"The deep circumflex iliac veins flowed into the two lateral trunks, and at this level from each lateral trunk arose a small vein which ran cranially, dorsally and medially to become dorsal to the aorta, and these veins then joined to run forward on the dorsal aspect of the aorta to enter the right lateral trunk about

two centimetres caudal to the point of commencement of the vena cava. (Fig. 1A, Plate 2.)

"As far as could be ascertained, the arrangement of the rest of the venous system was normal, apart from a double left renal vein.

"The ureters, from their origin at the hili of the kidneys, ran caudally and medially in the subperitoneal tissue to cross the two lateral trunks dorsally. They then passed caudally and slightly ventrally to gain the urogenital fold of the peritoneum in the normal manner." (Fig. 1A, Plate 1.)

Case II.—Adult Male Cat.

The caudal vena cava was formed by the union of the common iliac veins and appeared to be normal; however, the right ureter ran an abnormal course in relation to it. Leaving the hilus of the right kidney, the ureter ran caudally

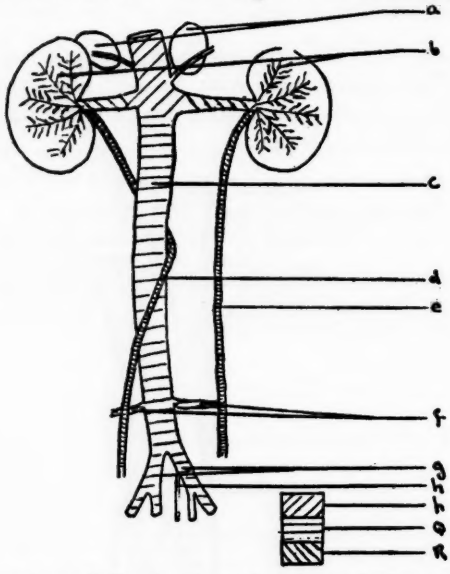


FIG. 1B.

Diagram to show the arrangement and origin of the caudal vena cava in Case II.

(a) Adrenal glands. (b) Kidneys. (c) Caudal vena cava. (d) Right ureter. (e) Left ureter. (f) Deep circumflex iliac veins. (g) Common iliac veins. (h) Middle sacral vein. (p) Sub-cardinal origin. (q) Posterior cardinal origin. (r) Para-ureteric origin.

and medially, in the subperitoneal tissue, to pass over the caudal vena cava dorsally, two and a half centimetres caudal to the point where the right renal vein joined the caudal vena cava, and from this point the ureter passed caudally and slightly ventrally to reach the urogenital fold of the peritoneum. The left ureter ran a normal course to the bladder. (Fig. 1B.)

In both the above cases the ureters and kidneys appeared to be normal.

Embryology

In order to appreciate why these variant conditions can occur in the post-renal part of the caudal vena cava, it will be necessary to note briefly the main points in the development of the urinary system, and the venous system in the lumbar area.

During the development of the urinary system in mammals three paired

excretory organs appear in succession, namely, the Pronephros, Mesonephros and Metanephros, in the above order. The pronephros is situated retroperitoneally fairly far forward in the dorso-lateral part of the body wall. It consists of a number of simple tubules which develop from the intermediate

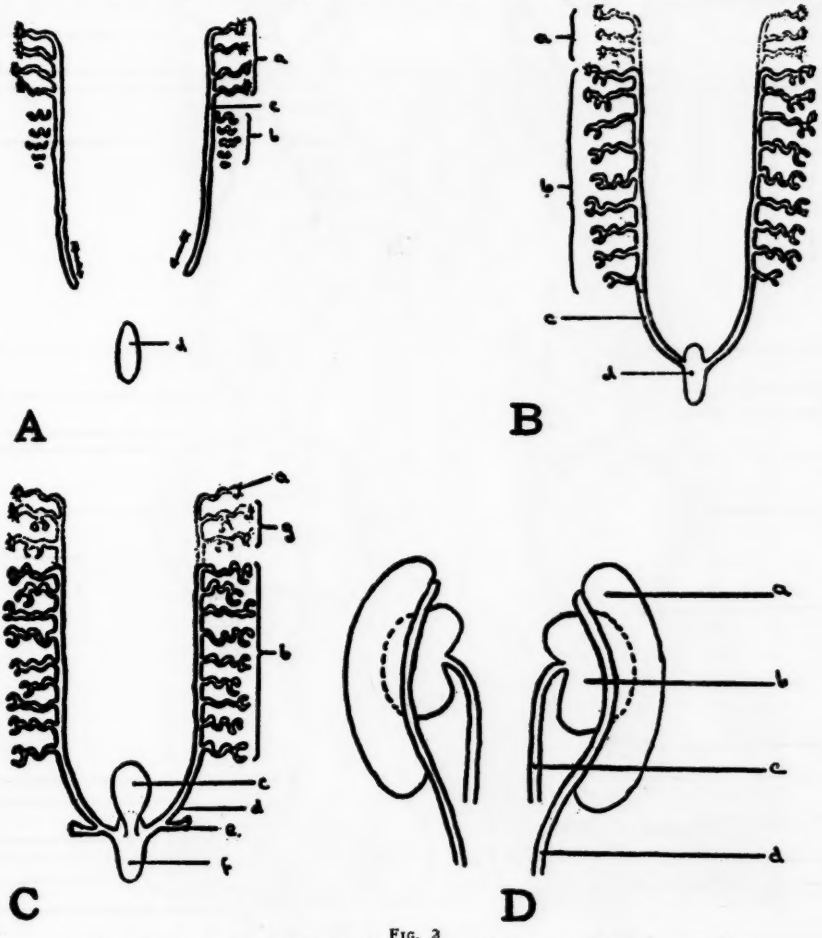
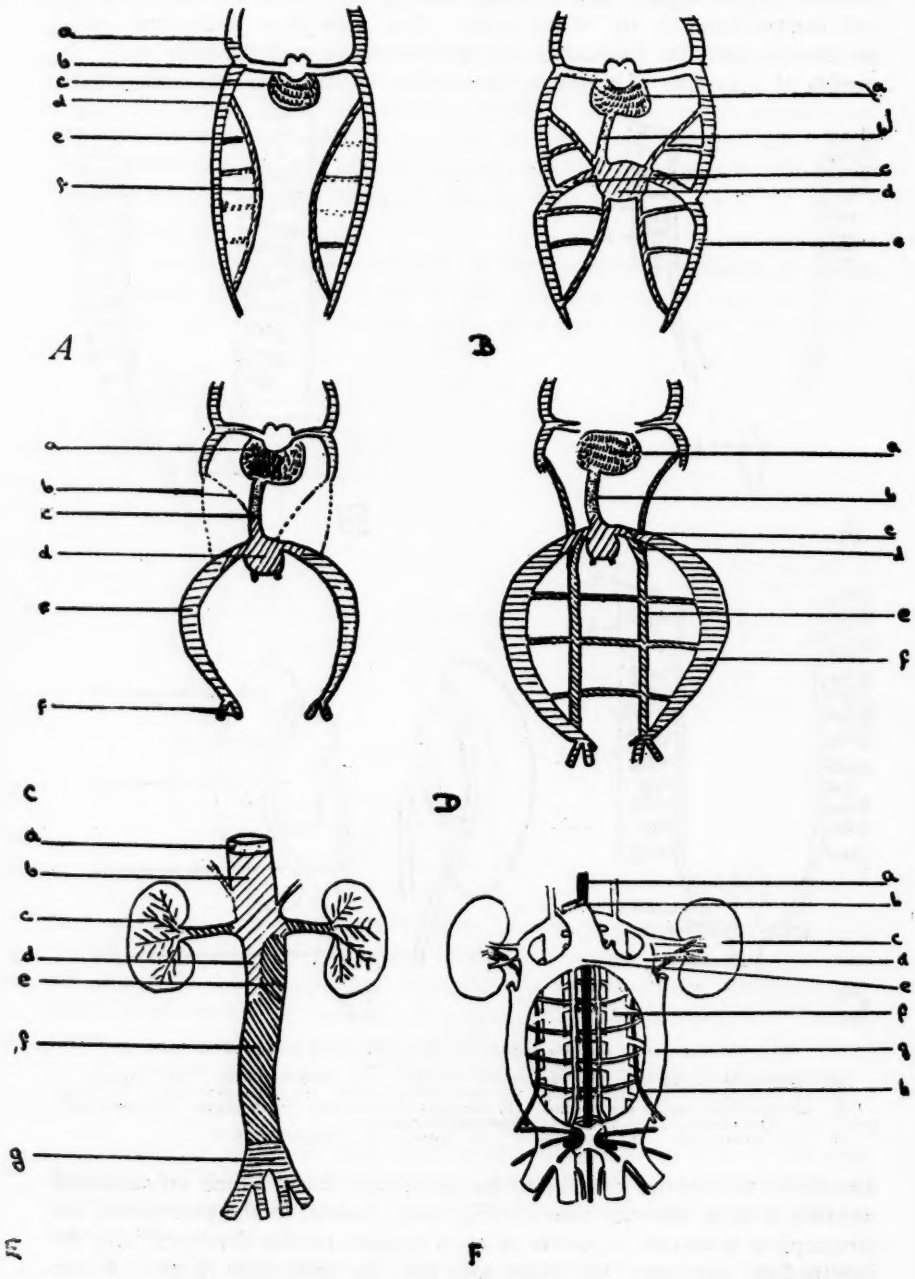


FIG. 2
Schematic diagrams to show the relations of pronephros, mesonephros and metanephros.
(A, B & C after Patten.)
A. (a) Pronephric tubules. (b) Mesonephric tubules. (c) Pronephric duct. (d) Cloaca.
B. (a) Pronephric tubules degenerating. (b) Mesonephric tubules. (c) Mesonephric duct. (d) Cloaca.
C. (a) Pronephric tubules degenerating. (b) Functional mesonephros. (c) Allantois. (d) Mesonephric duct. (e) Metanephros. (f) Cloaca. (g) Mesonephric tubules.
D. (a) Mesonephros. (b) Metanephros. (c) Ureter. (d) Mesonephric duct.

mesoderm; the tubules give rise to the pronephric duct, which is continued caudally to open into the cloaca. (Fig. 2A.) Caudal to the pronephros, the mesonephros is formed; it consists of more complex tubules developed from the intermediate mesoderm, and these open into the pronephric duct. As the

FIG. 9.



(*Reference on page* 91)

PLATE 1

Shows the arrangement of the two lateral trunks and their relationship to the ureters in Case. I. The bladder has been reflected back.

(*Article by Hare, page 87*)

XUM

PLATE 2

Shows the arrangement of the two lateral trunks and the dorsal trunks after the removal of the aorta in Case I. The ureters have been cut.

(*Article by Hare, page 87*)

mesonephros is developing the pronephros degenerates; the pronephric ducts are appropriated by the mesonephros, and are termed the "mesonephric ducts." (Fig. 2B.) The metanephros has a dual origin, the part which eventually gives rise to the ureter, pelvis, and the collecting tubules, arising at a fairly early stage in the development as a small bud given off from the dorsal border of the mesonephric duct, just before it enters the cloaca. (Fig. 2C.) This bud hollows out and extends in a dorsal and cranial direction, the most cranial part becoming enveloped in the intermediate mesoderm at the caudal end of the mesonephros, and this gives rise to the remainder of the kidney tissue. The metanephros, or future kidney, continues to grow in a cranial direction, and finishes under the transverse processes of the first and second lumbar vertebræ in a position dorsal and medial to the mesonephros. (Fig. 2D.) The mesonephros has a transitory excretory rôle in the developing embryo, and when it degenerates, together with its duct, it plays a functional rôle in the male genital system.

In the development of the venous system, the first veins to be formed are the paired Anterior and Posterior Cardinal veins. The anterior veins drain that part of the body cranial to the heart, while the posterior cardinal veins which lie in the dorso-lateral part of the mesonephros drain the posterior part; the anterior and posterior veins of each side meet to form the Duct of Cuvier before entering the heart. (Fig. 3A.)

Soon after the posterior cardinal veins have appeared, a new pair of longitudinal veins are developed in the ventro-mesial part of the mesonephros. These are termed the Subcardinal veins and they drain the mesonephros, terminating cranially and caudally in the posterior cardinal veins, with which they have transverse anastomoses. (Fig. 3A.)

The right subcardinal vein lies very close to the hepatic sinuses, and through the medium of the caval mesentery a channel is formed from the right subcardinal vein through the liver to the heart; this channel is known as the hepatic part of the caudal vena cava. (Fig. 3B.)

At this stage the mesonephros is increasing in size and the right and left subcardinals are brought close together, and eventually fuse to form the inter-subcardinal anastomosis. At this level the transverse anastomosis between the

---

FIG. 3

Diagrams A, B, C & D show the stages in the development of the caudal vena cava.

A. (a) Anterior cardinal vein. (b) Duct of Cuvier. (c) Liver. (d) Posterior cardinal vein. (e) Transverse anastomotic branch. (f) Subcardinal vein.

B. (a) Liver. (b) Hepatic part of caudal vena cava. (c) Posterior cardinal inter-subcardinal anastomosis. (d) Inter-subcardinal anastomosis. (e) Posterior cardinal anastomosis.

C. (a) Liver. (b) Degenerating posterior cardinal and subcardinal veins. (c) Hepatic part of caudal vena cava. (d) Inter-subcardinal anastomosis. (e) Posterior cardinal vein. (f) Limb veins.

D. (a) Liver. (b) Hepatic part of cardinal vena cava. (c) Posterior cardinal inter-subcardinal anastomosis. (d) Anastomosis between para-ureteric vein and posterior cardinal inter-subcardinal anastomosis. (e) Para-ureteric vein. (f) Posterior cardinal vein.

E. *Shows the origin of the parts of the caudal vena cava..*

(a) Hepatic part. (b) Right subcardinal vein. (c) Kidney. (d) Part of the inter-subcardinal anastomosis. (e) Branch from the right para-ureteric vein to the inter-subcardinal anastomosis. (f) Right para-ureteric vein. (g) Posterior cardinal anastomosis in iliac region.

F. *Composite diagram of the embryonic veins of the cat.* (After Huntington and McClure.)

(a) Aorta. (b) Hepatic part of the caudal vena cava. (c) Kidney. (d) Branch from para-ureteric vein to the inter-subcardinal anastomosis. (e) Inter-subcardinal anastomosis. (f) Para-ureteric vein. (g) Posterior cardinal vein. (h) Ureter.

XUM

posterior cardinal vein and the subcardinal vein increases in size, and is termed the posterior cardinal inter-subcardinal anastomosis. The left subcardinal vein and the right and left posterior cardinals cranial to the inter-subcardinal anastomosis degenerate for the most part, and are no longer interesting for the purpose of this description. (Fig. 3C.)

The kidneys (metanephros) now occupy a position dorsal to the lumbar part of the posterior cardinal veins under the transverse processes and the first and second lumbar vertebræ.

A new plexus develops dorso-medial to the posterior cardinal veins and lateral to the aorta and trunks of the sympathetic nervous system. This plexus soon forms a longitudinal trunk on either side, the Para-ureteric veins (Supra-cardinal veins). (Fig. 3D.) The para-ureteric veins join the posterior cardinal veins cranially, and also caudally close to the point where these are joined by the limb veins. Transverse anastomotic veins pass between the para-ureteric veins dorsal to the aorta, and between the para-ureteric veins and the posterior cardinal veins. (Fig. 3D and F.) On a level with the inter-subcardinal anastomosis a well-developed anastomosis is formed on either side between the para-ureteric vein and the posterior cardinal inter-subcardinal anastomosis. Eventually the caudal vena cava is formed from the following parts:—

1. Hepatic part of caudal vena cava.
2. Part of the right subcardinal vein.
3. Part of the inter-subcardinal anastomosis.
4. The right para-ureteric vein and its branch to the inter-subcardinal anastomosis.
5. Posterior cardinal anastomosis in iliac region. (Fig. 3E.)

Discussion

During the development of the caudal vena cava, there is a phase in which there are four main functional channels through which the blood may flow from the posterior part of the body to the inter-subcardinal anastomosis and thence to the heart via the hepatic part of the caudal vena cava. Normally, the right para-ureteric vein is the one which persists, but any of the others may be retained. Huntington and McClure (1920) have published a composite diagram of the embryonic veins of the cat, reproduced here (Fig. 3F), and have described fifteen types of caudal vena cava occurring potentially in the lumbar region.

In Case I it would appear that the two lateral trunks are, in fact, the persistent embryonic right and left posterior cardinal veins, and this view is substantiated by the fact that the ureters pass dorsally over the lateral trunk before continuing their course to the urogenital fold of the peritoneum; the posterior cardinal veins are the only embryonic channels which bear this position relative to the ureter. (Fig. 3F.) The dorsal trunk would appear to be formed mainly from the right para-ureteric vein, but a transverse anastomotic branch between the right and left para-ureteric veins has persisted to form the branch running from the left lateral trunk to the dorsal trunk. That part of the lateral trunk on the right side after the junction of the dorsal trunk and before the formation

XUM

of the vena cava proper is the persistent part of the anastomosis between the right para-ureteric vein and the inter-subcardinal anastomosis, with part of the inter-subcardinal anastomosis. (Fig. 1A.)

In Case II it would appear that the caudal vena cava has been formed from the embryonic right posterior cardinal vein, because in this case the right ureter passes over the caudal vena cava dorsally before passing back to the bladder, whilst the left ureter has a normal course.

McClure and Butler (1925) state that: "The relatively early degeneration of the posterior cardinal veins in the embryo of man, as compared with that of the cat, is undoubtedly associated with the fact that, while an atypical condition of the venous system in which the posterior cardinal veins are concerned is rarely found in adult man, this is a frequent occurrence in the adult cat."

Since the discovery of these two cases, a considerable number of cats have been dissected in this Department, and in all these specimens the formation of the caudal vena cava and the ureters has been found to be normal.

It may be of some clinical interest that two cases have been recorded in man. Gladstone (1911) describes a case in a male, in which the right ureter passed behind the inferior vena cava before pursuing its normal course to the bladder. The duct of the ureter above the part which crossed behind the inferior vena cava was dilated; the pelvis of the ureter and infundibula were also dilated. Kolisko (1909) describes a case similar to the above, in which there was hydronephrosis and dilatation of the pelvis and ureter above the point where the ureter passed behind the inferior vena cava. Is there a possibility that something similar may be noted in the cat?

Summary

Two cases of an atypical arrangement of the caudal vena cava in the cat are described.

A brief description of the development of the urinary system and caudal vena cava is given.

An attempt is made to explain the anomalies in the light of embryological knowledge.

Acknowledgments

I wish to express my thanks to Mr. R. C. S. Hood and Mr. E. Roberts, of the Royal (Dick) Veterinary College, the former for his care with the photographs and the latter for his technical assistance.

REFERENCES

Huntington, G. S., and McClure, C. F. W. (1920): *Anat. Rec., 20,* 1-30.
McClure, C. F. W., and Butler, E. G. (1935): *Am. J. Anat., 35,* 331-383.
Reagan, F. P. (1927): *Anat. Rec., 35,* 129-148.
Reagan, F. P., and Tribe, M. (1927): *J. Anat., Lond., 61,* 480-482.
Reagan, F. P., and Robinson, A. (1927): *J. Anat., Lond., 61,* 482-484.
Hamilton, W. J., Boyd, J. D., and Mossman, H. W. (1944): "Human Embryology." Heffer, Cambridge.
Patten, B. M.: "Embryology of the Pig." Blakiston, Philadelphia.
Gladstone, R. J. (1911): *J. Anat., Lond., 45,* 225-231.
Kolisko, F. (1909): *Anat. Anzeiger, 35,* S. 520.

XUM

ANIMAL HEALTH SERVICE

THE VETERINARY AND REMOUNT SERVICE, MIDDLE EAST LAND FORCES—THE ROYAL ARMY VETERINARY CORPS

By CAPTAIN J. R. GALWEY,
Military Observer in Egypt

The Work of the R.A.V.C.

To the average person the word "veterinary" immediately suggests *horses*, and they are apt to think that, with the almost complete mechanisation of the Army, this means the end of the surgeons' work. However, the reverse is very much the case. The horse is only one of the many animals looked after by the R.A.V.C.; there are still quite a number of horses used in the Army, as well as mules, donkeys, bullocks, camels and dogs. Those who are sceptical would be astounded at the part animals play in M.E.L.F. Animal doctoring is, however, only *one* part of the duties of this Corps.

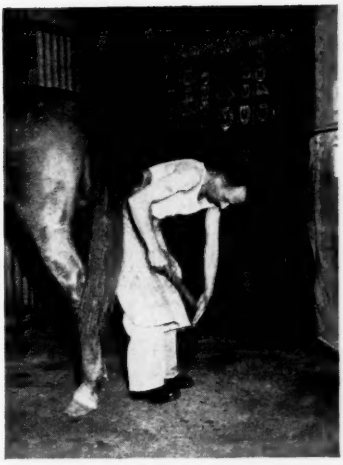
"Bully" on the Hoof

One of the most important of the tasks of the R.A.V.C. is the inspection of meat. The British soldier is as fond of fresh meat as anyone else—in fact, rather more so, owing to the amount of the tinned product he has to consume during the course of his service. The Army try to provide it for him whenever possible. The ration he receives to-day is not as large as it was before the war because it is kept in line with the amount allowed to his countrymen at home. Despite the decrease in quantity for the individual, the bulk is greater owing to the increase in Army numbers. In most overseas stations the meat is supplied by contractors who purchase locally. This saves valuable shipping space and the cost of transport. There are snags in this. In Africa, for example, cattle suffer from a large number of diseases which, though not apparent in the live beast, are nevertheless a real menace to health. Because of this every carcase must be carefully inspected for contaminated or infected meat. Again, a native contractor's ideas as to storage and hygiene are primitive in the extreme, and only continuous vigilant inspection can ensure a reasonable standard of cleanliness and safety.

Mad Dogs and Lions

In most parts of the M.E.L.F. rabies is an ever-present menace and takes up a great deal of the time of the Veterinary Corps. It is impossible, even if anyone should want to do so, to prevent the British soldier from keeping pets. Therefore these pets must be safeguarded by preventive inoculations. Dogs are the commonest victims of rabies, but cats, monkeys and many of the queer pets that Thomas Atkins habitually adopts are also liable to this most unpleasant

Sergeant Dixon takes a horse round the riding school. The school is used for training young horses and exercising old horses.



Farrier Sergeant McNeill plys his trade—the oldest trade mentioned in the British Army; it was recognised in the time of Henry V. It has probably existed since the first horse was used in battle.

A fine litter of Great Dane pups bred and reared by the Veterinary and Remount Services, M.E.L.F. Only eight months old and already a handful.

TRAINING FOR THE YOUNG IDEA.—Old Sheila is harnessed with a young male to restrain him and show him how the job should be done.

(*Article by Galwey, page* 94)

XUM

disease. Not so long ago a unit in a lonely station adopted a lion cub as a pet. Unfortunately, the cub developed rabies. The local veterinary officer not only had to destroy the cub, by this time six months old, but to put every pet in the station under quarantine, as well as round up and destroy every "pi-dog" within a ten-mile radius. The cub was suspected of having contracted the disease from the local jackals, so a campaign of poisoning was started against them and the hyenas which are noted rabies carriers.

A Ring of Death

Poisoning should not be left in the hands of the inexpert. During the last war an officer discovered that a number of the dogs in the village in which his troops were stationed had rabies. He shot them and, having no serum for inoculation, had all pets destroyed. His greatest difficulty, however, was rounding up the "pi-dogs." To do this he applied for a supply of poison. When the poison arrived he first warned the local inhabitants and then laid down bait all round the town. Unfortunately, he put too strong a dose in the bait. The village was surrounded by a ring of death. The dogs ate the bait and died. The jackals and hyenas ate the dogs and they died. Day came, and down flew the kites, vultures, maribou storks and crows. They ate the dead bodies of the others and they died, too. Even, to the officer's great mystification, some of the local camels and goats departed this life as well. Having killed off all Nature's scavengers, he had to do the work himself. For days the village suffered, not uncomplainingly, from an all-pervading smell of burning corpses, most of them in an advanced stage of decomposition.

Treatment of Dogs

Army dogs now take up much of the R.A.V.C.'s time. These dogs are used for a number of important purposes and, though few of them would take a prize at Cruft's, they are nonetheless valuable. A highly-trained dog has involved a large amount of time, patience and expense. The loss of one means a considerable waste of public moneys, and this must be guarded against. A trained dog is as carefully cared for as a champion descended from a long line of champions. Great emphasis is laid on his daily welfare, toilet, food and water. For example, in Africa a dog must be "de-ticked" daily and the return of this pest discouraged with gammexane and other insecticides. Piroplasmosis (tick-fever) is very prevalent. Distemper, hard-pad, etc., have all to be watched for in this area. Mine-detector dogs sometimes pick up stones and swallow them, and these have to be removed, involving a major operation.

Dietry

Diet to a horse or dog is just as important as it is to a woman worrying about her waist-line or those extra inches round her hips! Normal supplies of forage for horses and mules are not always available and substitutes must be found. In the Canal Zone, for instance, it is difficult to obtain adequate supplies of good barley, so maize is used instead. Too much maize, however, may not

XUM

be good for the animals and the quantity given has to be regulated carefully. There is no pasture land in the Zone, and therefore hay is hard to procure. A substitute has been evolved locally known as "dries," composed of dried maize and millet leaves and various local green stuffs. The meat for dogs must be as carefully inspected as that for the human beings, and the drinking-water supplied to the horses, mules and dogs is as pure as that supplied to the hospitals. Another problem is that there exists a tremendous temperature difference between the months of May and December in the Canal Zone, so that a diet suitable for summer may be quite inadequate in winter.

An Exclusive Club

The Veterinary and Remount Unit in Egypt is very like a small and exclusive club. It is self-contained in that the personnel are specialists, performing their work without requiring to call in anyone from outside. As in an ordinary hospital for human beings, they have their own pharmacists, dispensers and, of course, surgeons for animals. They have also — which a "human" hospital does not have unless one can consider the orthopædic department a parallel — a farrier's shop. There are a number of National Servicemen in the unit, for the most part veterinary students, and one professional jockey—Dennis Jones. Jones is hoping to ride on Egyptian courses during his tour, but has been too busy as yet to be able to arrange it. He used to ride for Jack Jarvis of Newmarket and has already been approached by local stables.

The Veterinary Corps are like schoolmasters—they cannot stop talking "shop." In 90 per cent of cases when one of them is asked "What is your hobby?" the reply comes: "Horses." After all, their working time has been spent with animals; they are prepared still to occupy all their spare time either in company with them or talking about them. The unit is very proud at the moment of a litter of Great Dane pups that they have reared!

Sports and Games

They do have other interests. Lance-Corporal J. Robinson has played cricket for a first-class English side against the Gezira Club of Cairo, and before he left home he played Rugby football for South Midlands Schoolboys' XV. Sergeant A. (Sandy) Dickson used to be a top-flight Scottish amateur boxer and subsequently fought 355 fights as a professional. They are too small a unit to run teams of their own, but they combine with 203 Provost Company for cricket, football and hockey. They are keen on all outdoor pursuits, but their predominant interest is animals—particularly the horse.

England and Abroad

They have comfortable quarters and though to the layman the persistent smell of stables might seem a drawback, they prefer it to Chanel No. 5. After all, the smell of a good, clean stable is a pleasant one, calling up nostalgic memories of frosty winter mornings in the "Shires." The unit is sited among trees, and with the clink of the forge, the rattle of horses' hooves on cobbles, the sight of a terrier rooting around for rats, it is quite a surprise to meet an Arab sweeper coming out of a loose-box.

SOME FACTORS CONFIRMED WITH PRACTICAL ASPECTS OF PROGENY TESTING

By F. B. HUTT, D.Sc., Ph.D.

Department of Poultry Husbandry, Cornell University, Ithaca, New York, U.S.A.

Introduction

IT is desirable to discuss progeny testing in general, and about its place in poultry breeding. Progeny testing is the means by which the breeder identifies the sires and dams that can transmit to their offspring the things that he values. When this has been ascertained, the proven sire can be used extensively, so that he can transmit his valuable genes to the maximum possible number of descendants. The progeny test reveals more poor animals than good ones, but the animals proven unable to transmit their own desirable qualities can be eliminated soon. When the breeder speaks of proven sires, he means the ones that measured up to his hopes—not the ones that failed to do so.

Progeny testing is in many respects a fickle jade. It is the breeder's most useful servant, but it can become the master and make the breeder a slave to the inevitable records that must be kept for its operation. It provides enough glittering successes to lure the breeder on and on, in spite of the even more numerous failures. Adequate analyses of the records require constant and tedious toil, but the results are usually so fascinating that the breeder feels more than repaid for his effort.

Finally, progeny testing is for some poultrymen a *sine qua non*—the only means of making progress—but for others it is completely impracticable. In this last category are included the commercial poultrymen, who buy their chicks annually and whose chief business is the large-scale production of eggs and poultry, and also the farmer who has no time for trap-nests or for records. Although these people can not themselves do progeny testing, they should know something about it, for it is to the specialised breeder—the progeny tester—that they should go for the cockerels to head their flocks. Thus, even though the progeny testers may comprise less than one per cent of the poultry keepers, they are the mainstays of the industry, responsible for most of the improvement of the stock. Their rewards should be proportionate—not to their number, but to their importance, and to their success.

Pedigree—or Proven Sires?

For many years poultrymen, relying on the old dictum that "like begets like," felt that birds good in appearance or performance should beget similarly desirable offspring. This belief was later bolstered up by a certain pride of pedigree and the assumption that a few generations of respectable ancestors endowed their descendants with some assurance of similar respectability. However, as every progeny tester has found out, appearances are deceiving, and pride of pedigree is no infallible guarantee that one may also take pride in the progeny.

This is best demonstrated by diallel crosses in which full brothers are mated at different times with the same pen of females. In several such tests at Cornell

Summary of a paper delivered at the B.O.C.M. Poultry Conference, London, October 11, 1950.

it was found that full brothers, in spite of their identical pedigrees, differ as much as unrelated males in the transmission to their daughters of such quantitative characters as egg production, resistance to leucosis, and "stubs" (feathers) on the feet.

Other tests have shown that the egg production of a cockerel's dam gives little or no indication of the eggs to be obtained from that cockerel's daughters. This applies to cockerels from dams with records upward of 200 eggs for a full laying year. For these reasons, and because like merely *tends* to beget like, the progeny test is the indispensable tool of the progressive poultry breeder.

Background of the Short Cuts

During the last 15 years, my colleague, Dr. R. K. Cole, and I have spent much of our time in breeding strains of White Leghorns resistant to leucosis. In that process we have encountered most of the difficulties that cause some breeders to give up progeny testing, and have devised various ways of simplifying the task. The problem is one of getting the maximum of information from the minimum of records. Although we have been concerned primarily with resistance to leucosis, the principles involved are the same as those involved in breeding for more and bigger eggs, or for any other multifactorial character. In fact, we have increased egg production, egg size and body size, because we wanted to demonstrate that it is feasible to breed not only for resistance to disease, but also for other economically important characters at the same time.

We hatch annually about 6,000 pedigreed chicks and start about 2,500 pullets on test each year. For each of these we determine cumulative egg production, egg size, body size, age and weight at first egg, age at death and cause of death. Averages for dams' and sires' families are computed four times a year for each generation. Thanks to some of the short cuts introduced, all these records are now kept in order by one capable girl with part-time assistance. This, of course, refers only to the office work. She helps to take records in the pens and on the rearing range, but does not care for the birds.

It should be understood that in discussing some of the practices that we follow I am not urging anyone to follow them to the letter. There are probably other "systems" better adapted to other conditions. I am merely reporting the little tricks that we are now using, with the hope that some of them that have made progeny testing easier and more profitable for us might help others to do the same.

The 500-day Test

To begin with our first and most valuable short cut, our testing period is not the traditional one of 365 days from first egg, but the more useful one of 500 days from hatching. For birds that begin to lay at 180 days, laying ability is thus measured in 320 days, which is 45 days less (about 12 per cent) than the old test for a full laying year.

The chief advantages of this scheme (which has been in operation since 1934) are as follows:—

(1) The first chicks hatched in any one year have completed their tests by

the time that the first pullets of the next year are ready to be housed. In our work this means that hens hatched in early March of 1949 vacated their quarters in late July of 1950. At weekly intervals thereafter (corresponding to weekly hatches in 1949) other hens go out, until the last finish about the middle of September. Their places are taken by the incoming pullets of 1950, which are housed from August until September. Such a maximum utilisation of housing space is not possible with the longer test.

(2) Final computation of the family averages can be done in September, and the prospective breeding birds for the next spring can be chosen then. When testing for 365 days from first egg, there are always some hens that begin laying late and must be allowed their time to late November or December before the books can be closed. That does not leave enough time for final calculations and selection of breeders before the next year's pens are to be made up.

(3) The test to 500 days of age puts a premium on early maturity. The pullet beginning at 180 days automatically gains a lead over the one beginning at 200 days that may be worth anything up to 200 eggs on her record.

(4) After completion of their 500-day test, the hens not wanted for breeding can be marketed at once, or maintained at maximum production under artificial lights, with culling as needed. The potential breeders are spared this forcing, but are trap-nested and allowed to lay (without lights) up to the end of October.

The chief criticism of this shorter test is that it does not specifically measure persistency—the ability to keep on laying from August to October. However, the hens capable of persistent laying are most likely to be the very ones that have already proven themselves superior layers up to August first. There is little or no evidence that persistency is inherited independently of general laying ability. Anyone who wishes to see when his hens stop laying can easily do so with the best birds which are kept beyond the 500-day period as prospective breeders.

Another criticism is that poultrymen are not accustomed to any measure of egg production except that for 365 days from first egg. Similarly, man was once accustomed to travel only by horse. In 1949, the R.O.P. programme for for accrediting poultry records in Canada reduced its testing period to 300 days from first egg, and in 1950 the same short test became optional in the United States. This will serve the same purpose as ours from the standpoint of management, although it does not put any premium on early laying.

Records

We keep records, each on a separate sheet or card, as follows:—

(1) For each pullet.

(2) For each dam, grouping all her daughters.

(3) For each sire, showing the averages for the daughters of each dam to which he was mated.

(4) A master sheet, permitting comparisons of all sires under test.

There is also a record of incubation and rearing for each hen used in the breeding pens. These records are devised for experimental work, but, in some form, similar ones are necessary for most progeny tests.

XUM

The best short cut in our record system was the adoption seven years ago of punched and slotted cards for the annual records of our 2,500 pullets. These are kept in numerical order, so that monthly records of egg production can be easily transcribed. Four times a year they are sorted out by families for computation of family averages for sires and dams. This is quickly done with a sorting needle which first sorts the cards by strains (of which there are three) and then, within each strain, into sire families. When the records have been transcribed from the individual cards to the dams' summaries, they are quickly put back in numerical order by using another set of holes and slots.

With these cards and a calculating machine, it is possible to have the family averages available in about four days for one strain, in about seven days for the whole population. Speed in this operation is particularly essential at the first quarterly summary, made as of January 1 each year. Rapid evaluation of the records to the end of December is then necessary for selection of the cocks, hens, cockerels and pullets that are to be used in the breeding pens.

Partial Tests and Ranking

An important short cut lies in making full use of partial tests. It is all very well to set up rigid standards for breeding hens such as 240 eggs, 25 ounces to the dozen, and 4½ pounds for Leghorns, but flexible standards are more workable, as when an outbreak of disease lowers the flock average by 20 eggs. It is even more important to detect early the sires and dams that will have the best average production for their daughters, and to use them again, long before the completion of tests for their daughters of the first season. This is made possible by the use of partial tests.

These are particularly useful in early January of each year, when selections for the breeding pens should be begun. A dam is then evaluated according to the average record for all her daughters in comparison with similar averages for all the dams mated to the same sire. By ranking the averages for 12 to 18 dams and considering these in relation to the average for all daughters of the sire, it is easy to see, even after only four months of laying, which dams are boosting the average and which depressing it. One may then use all those above average, or only the top three, depending upon the amount of "selection pressure" that can be exerted. Similarly, each cockerel under test can be evaluated by his rank among contemporary cockerels with respect to the average performance of daughters.

We use these partial tests to rank families according to egg production, egg size, body weight, and viability. The rankings at January 1 seldom agree exactly with the rankings at 500 days, but the discrepancies are in the families near the middle. The best and worst in January are likely to be in the same positions in July. Partial tests are less accurate with respect to viability than for the other three items mentioned, but, nevertheless, they are valuable guides. The important things about these partial tests are: (1) That they permit immediate re-use of the best sires and dams, thus getting from them an extra

year of reproduction; and (2) they tell us which cockerels to test, viz., those from the best sires and from the best dams mated to those sires.

Sib Tests

Cockerels are picked by the sib test. Actually there are two sib tests—one for full sisters, and one for half-sisters. The former provides a progeny test of the cockerel's dam—the latter of his sire. One must remember, however, that these sib tests are only starting points. They merely suggest which cockerels are likely prospects. The final evaluation of those cockerels must depend upon the performance of their offspring, and not upon that of their sisters.

Sampling

The progeny tester can save himself much work by doing no more than is necessary. In other words, when adequate samples will provide 90 per cent of the complete story there is little advantage in doing twice the work (unless one enjoys it) to get the last 10 per cent.

Examples of useful sampling include trap-nesting four days a week, or less, and weighing only a few eggs per hen each year. Weighing eggs and computing the averages is a tedious business. We now measure the definitive egg size in one week in March. We then try to get four eggs (no more) from every first-year hen that is laying. That gives us 25 to 40 per dam, and several times that number per sire. These suffice to differentiate the families and even the daughters within these families. Egg weights are similarly determined in December, before they are up to final size. The information then obtained is necessary for the selection of breeding stock in January.

Another saving by sampling consists of housing no more daughters (of breeders previously untested) than are necessary for an adequate test. If one is breeding for viability, there should be 40 to 60 daughters per cockerel, depending on the prevailing level of mortality, but, if viability is no problem, and egg production is the chief objective, then 15 to 20 daughters should suffice, provided that they came from at least six different dams. The poultryman with ample space will want to keep more than that number in order to have dams' families of 8 or more, which should reveal some of his best dams. When large families have to be reduced, those eliminated should be picked at random, rather than on physical appearance, otherwise the reduced family has an initial advantage over the one unculled.

When space is at a premium, there is no point in keeping the daughters of any cockerel that dies after the breeding season is over. Similarly, small families of one to four daughters per dam do not yield enough information about that dam to justify their retention. They can be eliminated so long as there are enough birds left in larger families to provide a test for the sire.

Multiple Shifts for Cockerel Tests

With a single objective, the chance of a cockerel proving better than average is 1 in 2. Even if the pressure of selection be increased that only the

best 25 per cent are used again, there should be plenty of good proven sires available. However, no poultryman is satisfied with a strain that is good in only one respect. He wants birds of good size that lay well, that lay big eggs, and that can survive to lay a lot of them. With four such objectives, if they are independent, the chance of finding a cockerel better that average in all four is only 1 in 16. When one demands also better than average hatchability and non-broodiness, the chance of finding a sire superior in all six objectives becomes only 1 in 64.

When it became evident, in breeding for resistance to leucosis and for other characters of economic importance, that the chief limiting factor in our work was a shortage of superior proven sires, that obstacle was overcome by testing each year what we have called, in our laboratory jargon, " double shifts " or " multiple shifts " of cockerels. With 10 small pens available for cockerel testing, we have tested in them 20, 30 and even 40 cockerels per year, and thus provided all the proven sires that we can use.

In its simplest form, when only two shifts are tested, the first series of males is removed as soon as enough fertile eggs are in the incubators to ensure about 50 daughters per cockerel. After the first series of males goes out, eggs are credited to them for three days thereafter, but the replacing second shift of cockerels goes in the pens on the afternoon of the second day. Eggs from the fourth to the eighth day are marketed, but nine days after removal of the first shift (hence seven days after introduction of the second) eggs are saved and credited to the second lot of males.

In modifications of this system to test three or four series of cockerels per season, artificial insemination is used when the replacing males are introduced, to shorten the interval between successive males when paternity is uncertain. If three or 4 series of cockerels are to be tested in a normal hatching season of nine or ten weeks, it is desirable to have at least 18 females per pen in order to get quickly enough hatching eggs to yield about 50 daughters per male.

Tests of Dams

Much of the foregoing discussion has been concerned with the testing of sires. They get first consideration because, whereas a single hen may have 8 to 20 daughters per season, one good proven sire used continuously through that same season will have 12 to 20 times as many daughters as the average hen in his breeding pen. Nevertheless, tests of dams are desirable, too. The multiple shift of cockerels provide somewhat better progeny tests for the hens than does a mating in which one hen is mated with the same male all season. Hens producing better than average daughters by each of three different sires are more likely to yield consistently good sons and daughters than is the hen tested with only a single male.

Cockerel Tests and Proven Sires

Finally, a word may be necessary about the balance to be struck in apportioning the available breeding pens for testing cockerels, or for the use of proven

sires. Any really outstanding proven sire should be mated right through the season, and with the best proven dams available, as long as he can reproduce. From such matings come the cockerels for testing. When several proven sires are available, more of the available pens can be utilised for them, as the testing of new cockerels is then less essential. This is particularly so if the proven sires are not all old birds that may prove infertile. Conversely, when proven sires are scarce, as at the start of progeny-testing, more of the available pens should be used for testing cockerels. We occasionally dispense with cockerel-testing for a year in one of our lines, when the previous years' tests have left us half a dozen good sires to choose from. Since the average daughter from a proven sire is better than the average one from untested cockerels, it is desirable to give as many of the pens to proven sires as their number and quality warrants.

THE RESULTS ATTAINED IN COMBATING BRUCELLOSIS IN CATTLE IN NORWAY

By H. BAGGERUD,

Chief of Infectious Diseases Division

THE following brief account is based upon material in possession of the Veterinary Directorate, and I hereby beg to convey my best thanks to Veterinary Director-General L. Slagsvold for permission to use that material.

The combating of brucellosis in cattle in Norway started on January 1, 1935. An account of the method used was previously given in the *Journal of the American Veterinary Medical Association* for August, 1947.

The salient features of this method are:—

(1) It is based upon the principle of voluntary collaboration;

(2) Adequate regulations for preventing the spread of infection from herds already affected; and

(3) The eradication of the disease in such infected herds by repeated blood tests and slaughter of reactors.

When the work started brucellosis was diagnosed in fourteen of our twenty counties. The distribution is shown in Table I.

TABLE I

Distribution of Brucellosis in Counties

County	No. of herds reported, 1935 to 1951
Ostfold	76
Akarshus	97
Hedmark	401
Oppland	308
Buskerud	205

TABLE I (*Continued*).

Distribution of Brucellosis in Counties

County	No. of herds reported, 1935 to 1951
Vestfold	52
Telemark	117
Aust-Agder	1
Vest-Agder	16
Rogaland	85
Hordaland	553
Sogn og Fjordane	913
Möre og Romsdal	357
Sör-Tröndelag	11
Total	3,192

TABLE II

The results attained

	No. of years since combating began	Total reported infected herds	Herds with reactors at the last testing		Herds negative at the last test		Herds in which the disease is deemed to be eradicated at the given date	
		No.	No.	%	No.	%	No.	%
1/1/1936	1	2,278	855	37.53	787	34.55	636	27.92
1/1/1937	2	2,741	321	11.70	347	12.70	2,073	75.60
1/1/1938	3	2,886	142	4.92	96	3.33	2,648	91.75
1/1/1939	4	2,992	110	3.68	32	1.07	2,850	95.25
1/1/1940	5	3,076	70	2.28	31	1.01	2,975	96.71
1/1/1941	6	3,116	26	0.83	12	0.39	3,077	98.78
1/1/1942	7	3,130	21	0.67	7	0.22	3,102	99.11
1/1/1943	8	3,143	15	0.48	6	0.19	3,122	99.33
1/1/1944	9	1,152	7	0.22	8	0.25	3,137	99.53
1/1/1945	10	3,168	15	0.47	4	0.13	3,149	99.40
1/1/1946	11	3,178	7	0.22	3	0.09	3,168	99.69
1/1/1947	12	3,186	8	0.25	1	0.03	3,177	99.72
1/1/1948	13	3,186	2	0.06	1	0.03	3,183	99.91
1/1/1949	14	3,191	6	0.19	0	—	3,185	99.81
1/1/1950	15	3,192	1	0.03	1	0.03	3,190	99.94
1/1/1951	16	3,192	0	—	0	—	3,192	100.00

TABLE III. "*Recurrences*" and n

	1936	1937	1938	1939	1940
Additional infected herds reported	463	145	108	84	39
"Recurrences"	36	47	38	32	3
Total accessions	499	192	146	116	42

As will be seen from the table, the work of combating the disease made rapid progress in the first years. After three years the prevalence of the disease had been reduced by over 90 per cent and after six years by over 98 per cent. During the German occupation the Germans imported cattle infected by brucellosis from Denmark and as these animals were stabled in German encampments all over the country and sometimes also forced in upon the farms in the vicinity, it was obviously impossible to avoid some spreading of infection. Owing to the enforced slaughtering in connection with German requisitions of meat it became very difficult to buy cattle and the critical food situation made it difficult for the farmers to do without milk. Consequently the control-work could not be pursued so effectively as desired during the war years and the first years after the liberation. Owing to all these circumstances the whole work was delayed. The method used and the regulations for combating the disease proved, however, to be sufficiently effective to prevent any appreciable spread of infection, and at the beginning of the year 1951, 100 per cent of the infected herds had been released from control.

In the line headed "Additional infected herds reported" is stated the total number of herds not previously declared infected which was reported as infected in said year. During the first years a number of these herds undoubtedly had been infected for some time, but had not been discovered and reported previously owing to the fact that it took us several years to cover all the infected districts by the blood test. Consequently, the figures do not represent the real number of herds infected during that period of time for the first three or four years.

In the line headed "Recurrences" is given the number of previously released herds in which the disease cropped up again. Some of these are true recurrences, as the disease reappeared owing to defective disinfection or to an animal having been infected without showing positive reaction, etc. The rest are herds which had been infected once again, mostly on common pastures. These "recurrences" have been far less frequent than we had dared to hope. During the whole campaign we had 187 such herds, and it is considered that only about half that number are actual recurrences, representing between 2 and 3 per cent of the released herds.

During the last years we have used the ABR milk-ring-test as a check, and several thousand herds in previously infected districts have been tested.

The cost of eradicating Brucellosis in Norway amounted to about 2.220.000 Kroner (about £111,000). Of this amount the farmers have received as compensation for slaughtered animals about 1,720,000 Kroner (about £86,000).

nces"	*and newly-infected herds*											
1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950	Total
84	39	15	13	9	16	10	8	0	5	1	0	914
32	3	8	5	3	9	3	0	0	3	0	0	187
116	42	23	18	12	25	13	8	0	8	1	0	1,101

Travelling expenses and fees to veterinarians amount to approximately 390,000 Kroner (about £19,500), while the rest, 110,000 Kroner (about £5,500) has gone to meet the costs of administration and other expenses. The whole campaign has cost less than what the disease had previously been costing our country in one year.

BIBLIOGRAPHY

H. Baggerud: "Combating of Brucellosis in Cattle in Norway." *J.A.V.M.A.*, Tome CXI, No. 845, August, 1947.

AN ANTIDOTE FOR D.D.T. POISONING—A RECORD OF 35 CASES SEEN

By L. A. P. BRITO-BABAPULLE, B.Sc.(Lond), M.R.C.V.S., D.T.V.M.(Edin.)

The literature that is available on the subject of antidotes for D.D.T. poisoning makes mention of those agents that have been used solely to counteract the side effects of such poisoning, e.g., precipitation of calcium ions, or suppression of symptoms arising from the toxic effects of this potent insecticide, etc. Newer forms of D.D.T., where the chlorine has been replaced in the D.D.T. molecule by fluorine, has increased the potency of these insecticides in their destructiveness towards insects and cold-blooded animals, and will in the normal course of events take toll of all domestic pets that come in contact with it and are susceptible to it, unless adequate antidotal measures are applied early and quickly. It has been thought that toxic symptoms may be due to the precipitation of calcium ions in the blood resulting in a hypocalcæmia of a sort which was more pronounced in felines than in the canidæ. It is reported that either an intravenous or intraperitoneal injection of calcium gluconate will relieve these toxic symptoms in 3 to 4 hours, and that the prior administration orally of this gulconate will minimise or prevent toxic symptoms arising in those animals that are about to be sprayed or dipped with D.D.T. The U.S. Public Health Reports, 1947, list as antidotes urethane (ethyl carbamate) and dilantin (epanutin, or diphenylhydantoin sodium) as ameliorating the neurologic symptoms. The U.S. Surveyor-General's Office recommends avertin (tribromoethanol), paraldehyde and the barbiturates because of their sedative and anticonvulsant action. Other reports, notably by Harris, consider the barbiturates as being ineffective. Hamilton Kirk states that there is no specific antidote for D.D.T. toxicity.

The Antidoting Agent.—Good results have been obtained by the writer with the use of riboflavin as an antidote for the toxic effects of D.D.T. Riboflavin (also known as lactoflavin, vitamin B_2, vitamin G) is an essential constituent of Warburg's yellow oxidation ferment. It has been shown to be essential for physiological oxidation-reduction processes and plays an important part in sugar and fat metabolism of the animal body. This vitamin-protein-enzyme of the flavoprotein group, with a formula of $C_{17}H_{30}N_4O_8$, is

6,7-dimethyl-9 ribitylisoalloxazin, unites with a simple or complex phosphate and an enzyme-protein to produce an active enzyme called a "respiratory enzyme" of cellular tissues, which catalyses the transfer of electrons between the pyridine-nucleotides and the cytochrome systems, thereby assisting in the aerobic oxidation of glucose. This vitamin is essential for the retinal pigment, and was first isolated in 1933 and synthesised in 1935. As riboflavin-adenine-dinucleotide it has been obtained from liver, kidney, yeast, and milk. It is found in normal tissues, such as brain, heart, kidney, liver, particularly rich in the retina and in the body organs and fluids generally. In mg. per 100 grammes it has been found in cows' milk 0.1, yolk of hens' eggs 0.4 to 0.6, albumen of hens' eggs 0.4 to 0.5, cod 0.05, ox liver 0.1 to 2.4, ox kidney 0.8 to 1.6, yeast 1.8 to 3.6. The pure vitamin is in the form of orange-brown crystals with a melting-point of 282 degrees C. and shows a yellowish-green fluorescence in solution which is very sensitive to light. Combined with the different enzyme-proteins, riboflavin gives enzymes which oxidise d-amino acids, xanthine, aldehydes, and pyruvic acid, by acting as an intermediate in oxygen transfer, and therefore is a mediator-catalyst rather than an initiator-catalyst.

The Toxic Agent.—D.D.T., the abbreviation of p.p'-dichloro-diphenyl-trichloethane, is a white crystalline, extremely stable powder possessing a faint, but not unpleasant, glucosazone-like odour. Practically insoluble in water, but readily soluble in many organic solvents, which solutions are used in spraying houses in the antimalarial campaign in Ceylon. Many houses are possessed of teak furniture, doors and windows, and, according to the work of Raganathan, *et al., Science News Letter,* January 14, 1950, who found that the addition of a very small amount of beta-methyl-anthraquinone (a chemical compound found in Burma teak, in a chest of which some D.D.T. had been stored, and which first gave the clue as to the action), makes D.D.T. more potent and more deadly to insects for a longer time. It has been observed that the residual effects of D.D.T. on dogs last for about nine weeks, but in cattle that live out in the open for as short as one week, sunlight acting as the oxidiser which detoxicates the D.D.T. It therefore appears that the riboflavin that is normally found in the body fluids and tissues acting as mediator-catalyst probably detoxicates the absorbed portion and prevents toxic symptoms, and a paradox appears here that riboflavin solutions are themselves light-sensitive and rendered inactive.

D.D.T. has many uses, and will be used for various purposes:—

(1) D.D.T. can keep dog ticks under control if dusted on grass and shrubbery where pet animals play. In *Science News Letter,* May, 1947, 10 per cent of the powder applied at the rate of 1 oz. per 1,000 square feet, or a dusting of 2 to 4 lb. per acre, with extra applications along roadsides and drains, has been shown to reduce effectively the incidence of tick infestations.

(2) According to Dr. F. C. Bishopp, in *Science News Letter,* June 5, 1948, the world's food spoilage by insects, which stood at 32 per cent, has been controlled by the use of D.D.T. and other new insecticides.

(3) Estrada, veterinarian, of Guatemala, Central America, in the *Journal of the American Veterinary Medical Association,* June, 1948, has used 2.5 per cent

XUM

No.	Date		Subject	Subjective symptoms
1	25. 2.45		"Tummel," male black Scottie, 8 years old. Antirabies in March, 1944. Wormed two months. Antidistemper as a pup.	Lameness left hind leg. Walks backwards in reverse motion. Constipated. No fever. Appetite excellent.
	26. 2.45			Straining to defæcate. Temperature 100° F. Laboured breathing. Gait straddling with hind legs held stiff under body.
	27. 2.45	Morning		On supposing D.D.T. probability questioned owner who revealed that a home-made dilution of 10% pure D.D.T. in talcum powder was used on dog on 23.2.45 at mid-day. Violent scratching for two hours, then normal. As fleas still present the powder was re-applied the morning of 24.2.45. At night dog was tripping its legs when walking. 25.2.45: dog vomits its noon meal but later it ate the vomicus.
		Night		Paralysis symptoms worse. Dog apparently blind and not able to see its way about. Shivering. Extremities cold.
	28. 2.45	Morning		Turn for worse. Severe anæmia. Dog very listless. Marked paralysis. Anorexia.
		Night		Condition progressively much worse. Loose phlegm rales in throat. Temperature 99.9° F. Extremities all cold.
	1. 3.45	Morning		Dog miraculously better. Up and doing. Appetite voracious. Temp. 101° F.
	3. 3.45	Morning		Very much better. Gums almost as good as of old.
	25.10.45			Sudden death. Animal found dead in the morning with no previous symptoms.
2	8. 5.45		"Marcus," 3½ years old. Blue roan cocker. Male.	Paralysis gradually coming on in hind legs for one month. Appetite good. Motions normal. Urine normal. Moves with a stiffness like rheumatism and animal that used to like walks refuses to go out.
	15. 5.45			Was a wee bit better. But symptoms start afresh. Has had no temperature.
	24. 5.45			Slightly better, but is apt to flop even after the slightest exertion. Weak on hind legs. Constipated for two days. No temperature.
	30. 5.45			Gums anæmic. Very lackadaisical. On and off food from day to day. Passing blood and mucous in the stool.
	9. 6.45			Still passing blood and mucus in stool but not so frequently. Very anæmic. Weak on hind legs.
	11. 6.45			Remarkable improvement. Dog bounding about in full spirits. Ready to go for walks.

Objective symptoms	Treatment	Remarks
Temperature 102.5° F. No constipation or obstipation. No foreign body *in ano* to p : r. examination.	Glycerine enema. Brandy 2 drachms b.d.	In the January, 1945, number of *News Review* article on "Bugs in Wonder Drugs" appears a note that the U.S. Public Health Service revealed that toxicity tests on animals with repeated small doses of D.D.T. solutions gave symptoms of chronic poisoning with liver damage, convulsions and paralysis. After several days doses sometimes caused death.
Lungs clear. Heart good. Evinces pain on palpation of hind quarters.	Repeat of enema produces 2 fæcal masses. Potash bromidum 5 grains t.i.d.	
Dog walks with hind legs intertwining each other. Continues to strain, squats down with hind legs held stiff. Eyes look dry and glassy. Gums very anæmic. Occasional rigors. Fæces negative for worm eggs and cysts. Temp. 100.8° F.	Fresh liver extracts 1 oz. four times per diem. Chicken essence 1 oz. every two hours.	
Breathing laboured and dyspnœic.		
Lungs clear. Heart good. Temperature 100.2° F.	Adrenalin 1/5,000 2 c.c. i/m. Cipalon (liver) 2 c.c. i/m.	
Lungs appear passively congested. Eye reflexes poor. Must be touched to evoke blink reflexes.	Prognosis bad. M & B 125, thiamin 10 mg. and Vit. B_1 5 mg. 1 aa two-hourly.	Riboflavin 10 mg. in 2.2 c.c. intramuscularly.
Long congestion very slight. Walking much better. Gums colour good.	Repeat thiamin and Lactoflavin aa 10 mg. t.i.d.	Amelioration from M & B 125 is possible. More probably from vitamins B_1 and B_2.
Autopsy: Coarse cirrhosis of liver. Cholecystitis. Infarction right lobe. Red hepatisation right lung.		Liver damage from earlier D.D.T.?
Gums good. Temperature 101° F. No D.D.T. used on the dog but D.D.T. sprayed regularly in the house every week, specially under cupboards.	Calcii ostelin 3 c.c. s/c. Salicylate mixture with Liq. Donovani 120 m. and Nucis vom. 30 m. in 6 ounces aqua. 2 drachms t.i.d.	Calcium therapy with usual anti-rheumatic medicaments as dog had no direct contact with D.D.T.
Temp. 101.2° F. Pulse, respirations all normal.	Magnesium thiosulphate 10 c.c. 10% i/m. 1 drachm Collosol Calc. b.d.	This detoxicating agent did not ameliorate.
No costiveness but fæcal mass in rectum soft.	Benerva Forte 2 c.c. i/m. Calcii ostelin 2 c.c. s/c.	
Fæces positive for *Ancylostoma brasiliensis ova.*	Tetrachlorethylene 1 c.c. per 10 lb. in capsule. Two doses at 24-hour interval each.	Ancylostomiasis supervenes and masks anæmia of D.D.T.
Gums anæmic. Temperature 101° F. Weakness of hind quarters very marked.	Repeat second lot of capsules. By mouth Vit. B_2, 5 mg. t.i.d.	
Gums almost normal in colour. Gait steady.		Response to Riboflavin points to indirect absorption of D.D.T.

No.	Date	Subject	Subjective symptoms
3	22. 6.45	"Jamba," female Alsatian, 1½ years old. Never been in œstrus. Injections anti-rabies and distemper at six months of age. Wormed one month ago.	Pain in hind quarters, as she jumps she yelps with pain. Appetite good. Disinclined to play. Sleeps a lot. No fever. Motions normal. A powder with D.D.T. used for killing ticks used over 14 days before the symptoms. Percentage of D.D.T. not known by owner.
	26. 6.45		Dog fit and well.
4	9. 7.45	Calf, cross-bred Ayrshire, male. 5 months old.	As the animal was infested with ticks the cowman had applied pure D.D.T. in kerosene oil, as much as could be dissolved in 16 ounces, all over the animal. Animal fell down 2½ hours later and does not get up, refusing all food.
	10. 7.45		Animal making paddling motion and tries to get up. Anorexia.
	11. 7.45		Stood up two hours after last injection. Eating food.
5	22. 7.45	"Czarina," female brown Dachshund, 2½ years old. Immunised anti-rabies and distemper in April.	Animal walks with a peculiar dragging gait of hind legs. Marked anorexia refusing her favourite cheese. Very costive. Body does not feel feverish. D.D.T. never used on dog, but sprayed all over house and in dog kennel.
	23. 7.45	Dog very much better, almost her usual self. Begs for her food today.	
6	22.11.45	"Timothy," black and white smooth fox terrier, male, 2 years old. Anti-rabies one month ago. No anti-distemper.	Walking round in circles. Ignores owner and her commands. Legs appear lifeless and give way under him. Temperature 100.8° F. Will not look at food. D.D.T. sprayed on clothes in cupboard but nowhere in house. No D.D.T. at all on dog.
	26.11.45		Animal considerably better.
	28.11.45		Animal suddenly picked up a crop of fleas. Owner used 5% D.D.T. to check this on 27.11.45. Relapse of old symptoms.
	29.11.45	Dog very much better. Report 2.2.46 very fit.	
7	9. 4.46	"Jimmy," 1½ years old. Male black and white smooth fox terrier. Wormed two months ago. Inoculated anti-rabies and distemper when six months old.	Listless; anorexia; dull. Costive. Urine dark amber colour. Always had ticks on it until 5% D.D.T. was used as a dressing every week. Now only stray ticks found on animal. Great thirst. Animal weak on all four legs.
	10. 4.46		Much brighter, but weakness on legs still very marked. Appetite better, but finicky as to what it eats.
	11. 4.46		Markedly much better, almost its old self.

Objective symptoms	Treatment	Remarks
No fractures or luxations. No bowel stasis. No foreign body *in ano*. No pyrexia. No anæmia. Skin good, heart good, lungs clear.	Riboflavin 20 mg. i/m. Ab os Ostocalcium 1 tablet b.d.	
Temperature 102° F. Gums anæmic. Breathing a bit shallower, but no dyspnœa. Lungs clear. Heart good. Reflexes to pin-pricks of all four limbs present.	Riboflavin 20 mg. s/c. Colloidal calcium 3 c.c. i/m.	
Reflexes more marked, but animal makes no effort to get up.	Riboflavin 40 mg. in 8.8 c.c. i/m.	
The motion of forward progression with the hind legs' digits knuckling in. No anæmia. No other untoward symptoms.	Riboflavin 10 mg. in 2.2 c.c. i/m. Collosal calcium 1 drachm b.d. ab os.	
Circus movements in left-handed circles. Starey eyes with pupils dilated. Marked inco-ordination of hind legs. No fever. No previous distemper (or "cold") history.	Calcium gluconate 20 c.c. 20% i/m. Magnesium thiosulphate 10 c.c. 10% s/c.	
Circuitous ambling all absent. Dog walks well when called. Eyes have lost fixed stare into space.	Repeat of the same injections.	
Temperature 102° F. Gums a shade anæmic. Eyes with fixed glassy stare. Chin held pointed well forward. Bumping into objects, but makes no effort to bite them.	Riboflavin 10 mg. i/m., also ab os 5 mg. t.i.d.	
Temperature 103.6° F. Gums very anæmic. Spleen enlarged. Blood smears positive for *Piroplasma canis*. Fæces negative for ancylostomes and other parasites.	Phenamidine 5% 2.5 c.c. s/c. Sulfamerazine 0.5 G. and Brewer's Yeast Tablets 1 of each 4 times daily.	Piroplasmosis masks the D.D.T. toxicity.
Temperature 101° F. Refuses tempting food. Spleen as before.	Nucleinic acid 1 c.c. and Riboflavin 10 mg. mixed i/m.	
Marked improvement all round. Gums very healthy colour.	Continue Brewer's Yeast Tablets by mouth.	

No.	Date	Subject	Subjective symptoms
8	13. 4.46	"Jilliam," 7 years old. Male golden cocker spaniel. Was never ill before. No inoculations given. Never wormed.	Breathing quick and fast. Cough and retching. Vomited blood yesterday. Refuses all food. Animal feels hot to the touch. House and compound drains regularly sprayed with D.D.T. No lotions used on dog except Dettol as shampoo.
	14. 4.46		Animal feeling livelier. Taking interest in food.
	16. 4.46		Almost normal.
9	19. 4.46	"Sozy," 8 years old. Smooth fox terrier, black and white. Mitral incompetence of heart since 1.2.42.	Anorexia, anæmia, dullness since they returned from trip in hill country. Hotel room which they occupied along with dog was sprayed the day before their arrival with 10% D.D.T., stay there being for three days.
	20. 4.46		Dog better all round.
10	25. 4.46	"Snoopy," 8 years old. Female black and tan dachshund. Anti-rabies one year ago.	Jumps in terror when anyone approaches. Extremely nervous. D.D.T. used on walls of dogs' room nine days before, and two days after this last application symptoms started. Companion dog no symptoms.
	26. 4.46		Very much better.
11	10. 5.46	"Patsy," 2 - year - old Australian Sydney Silkie bitch.	Telephone message dog in great distress, panting, persistently licking lips in region under nose. Extreme prostration. Symptoms all came on after dog had been dressed with 5% D.D.T. for the second time in one week to keep down infestation of ticks.
12	22. 5.46	"Robby," 4 - year - old cross-bred Cairn terrier. No inoculations were ever done. Wormed two months ago.	Peculiar breathing in gasps. Extremely listless. Keeps on licking walls yesterday and to-day. D.D.T. used on walls of house first on 13.1.46 and next on 4.5.46. Animal appears powdery with scurfiness and dandruff even after grooming.
	24. 5.46		Peculiar breathing all stopped. Very much better. Scurf very negligible.
13	1. 6.46	"Binkie," 3 - year - old wire-hair fox terrier female.	Infested with ticks. Pulled off as many as could be taken, and 5% D.D.T. used to finish off the irremovable "sand ticks." Skin pustules and hair coming out in patches. Appetite poor. Dog grins and shows teeth these last two days.
			Miraculously recovered next day; the report of recovery (12.8.46) was from owner.
14	3. 7.46	"Ruby," aged ?, female beagle. Inoculated two months ago. Wormed three months ago.	Went out after a mongoose to-day; came back very stiff in hind quarters, lay down and refused to get up. Effort to stand—the dog was dragging its hind legs along the floor. D.D.T. used on dog the morning before she took ill. Has a temperature of 106° F.

Objective symptoms	Treatment	Remarks
Temperature 105° F. Pneumonia right side.	Sodium nucleinate 2 c.c. s/c. Sulfamerazine 0.5 g. and Nicotinic 50 mg. 4 times daily. Riboflavin 10 mg. b.d.	Simultaneous treatment for both conditions.
Temperature 102° F. Lung congestion resolving.	Riboflavin 20 mg. s/c.	
Temperature 100.4° F. Fæces negative for all worm ova.	Lactoflavin 10 mg. s/c. Collosol calcium 1 drachm t.i.d. ab os. Continue calcium.	
Extremely nervous and is startled, simulating strychninism.	Morphia ¼ grain s/c. By mouth Benerva compound tablets 1 t.i.d.	
Gave advice to give Benerva compounds pills, two every hour until my arrival.	Dead on arrival after second dose had been given. Gums very pallid and anæmic. No autopsy held as owner refused permission.	In small dogs toxicity appears greater. Probably cats are more susceptible for the same reason.
Gums anæmic. Glands normal. Temp. 100° F. Fæces negative for ancylostomes.	Lactoflavin 2.2 c.c. s/c. Collosol calcium 1 drachm m. et v. Ascorbic acid at 10 a.m. and 3 p.m., 2 tablets each dose by mouth.	
Pustular dermatitis with large circumscribed areas of bare skin. From some pustules capitulum of ticks were pressed out. Erythema of the bare under-surface of body. No fever. Gums fair to good.	Riboflavin 10 mg. s/c. Calamine lotion dabbed on skin.	
Blood smears negative for piroplasms. No external lesions indicative of bite of some venomous animal. No abrasions or bruising of lumbar regions. No areas of marked hyperæsthesia. Hind quarters no pain reflexes present. Temperature 107° F. No delirium.	Riboflavin 20 mg. i/m. Calcium gluconate 10 c.c. 10% s/c. Ice pack on head, cold water enema given. M & B 125 0.5 g. with 10 grains Aspirin and 50 mg. Niacinamide three-hourly.	Dog died in six hours of my seeing it. According to owner the paralysis progressed. Permission to hold an autopsy refused.

No.	Date	Subject	Subjective symptoms
15	21. 8.46	"George," 1-year-old male smooth fox terrier. Wormed two months ago.	Losing condition for the past 14 days for no apparent reason. Appetite lost for the last three days. No fever. Urine and fæces normal as before. D.D.T. used round house in the drains and gutters to keep down flies and mosquitoes. Dog sometimes drinks from drains.
	22. 8.46		Different dog to-day. Appetite very good.
16	23. 8.46	Cairn, male.	All animals belonging to the same owner. Aged 2 to 2½ years each. All dusted with D.D.T. 5%. All off food since last application.
17	24. 8.46	Dachshund, male.	
18	24. 8.46	West Highland, female.	
	25. 8.46		All taking food normally.
19	12. 9.46	"Butchie," female 6-year-old cross-bred beagle.	Coat coming out in tufts. Left eye showing diffuse filmy circumscribed whitish-blue patch on cornea. Difficulty in walking. D.D.T. sprayed when dog has its meals to keep off flies.
	13. 9.46		Very much better all round. Eye no visible change.
20	2.10.46	"Musso," male Alsatian dog, 6 years old.	Walking with one leg raised as if lame. General weakness of hind quarters. D.D.T. used in house as spray and on dog as a 10% powder.
	3.10.46		Walking very much easier. No limp.
21	13.10.46	"Gulliver," cross-bred dog, 7 years old.	Gradually getting paralysed for the last two months. Sherley's Nerve Cure was used but dog getting worse. D.D.T. applied in small quantities daily on dog round ears and on feet.
	15.10.46		Dog has regained use of its limbs. Walking with a straddling gait to-day but obviously getting stronger.
22	21.10.46	"Cherie," 1½-year-old cross-bred smooth fox terrier, female.	Off food for 15 days. Coughs after she drinks water and vomits white froth. 5% D.D.T. used 21 days ago.
	24.10.46		Very much better.
23	28.11.46	"Teddy," 10-months-old male Pomeranian dog.	Ill for one week. Anorexia. Finding difficulty in micturition and defæcation. D.D.T. used as spray in the house but not on dog.
	29.11.46		Appetite returns. Excreting quite normally.

Objective symptoms	Treatment	Remarks
Gums fair. Temperature 101° F. Ribs and spinal column very pronounced.	Riboflavin 10 mg. i/m. Benerva compound pills 1 b.d.	
	Continue with pills for a time.	
	Each animal Lactoflavin 10 mg. i/m.	
Temperature 100.8° F. Heart irregular. Gums anæmic. Fæces irregularly voided. Sample from rectum negative for ancylostomes ova.	Lactoflavin 2.2 c.c. s/c. Silvol 2% t.i.d. in eye. Oleum percomorphum 2 m. in eye at night.	
No observable lesions on leg. Slight arthritis of terminal phalanges only.	Lactoflavin 4.4 c.c. s/c. ½ Aspirin and 1 brewers' yeast pills b.d.	
	Lactoflavin 2.2 c.c. s/c. thrice only. By mouth Riboflavin 5 mg. every two hours.	
Temperature 103° F. Blood smears negative for piroplasmosis. Fæces negative for ancylostomes and Spirocerca ova.	Sodium nucleinate 2 c.c. and Riboflavin 10 mg. mixed i/m. 1 Aspirin with 1 5 mg. Lactoflavin t.i.d.	
No temperature. Pulse 120 per minute. Gums good.	Lactoflavin 10 mg. s/c. By mouth Vit. B complex pills 1 t.i.d.	

No.	Date	Subject	Subjective symptoms
24	14.11.46	"Timmy," male brindle bull terrier, 1 year old. Inoculated at six months of age.	Off food. Weakness of hind quarters. Owner positive that no D.D.T. at all being used in the house. Not at all on dog. Animal very listless. Sleeps most of the time.
	18.11.46		No improvement at all.
	21.11.46		Refusing all food. Has to be force-fed.
	24.11.46		No change in condition. Dog very much worse.
	30.11.46		Gums getting white as a sheet. Dog irritable when anything is done to it. Apt to snap. Owner now finds that the supposed non-D.D.T. spray that is used daily on his premises does contain 10% D.D.T., the supplying chemist having suggested the change to owner's wife.
	2.12.46		Was very poorly on 1.12.46 but is a bit better to-day and more lively.
	4.12.46		Almost normal to-day. Very much its old self.
25	5.12.46	"Pixie," 9 - year - old female Sydney Silkie.	Very listless. Off food. Fell off chair when jumping off. Feels feverish. Costive but passes much urine. D.D.T. spray used only in house.
	10.12.46		Improved considerably.
26	14.12.46	"Tinker," 5 - year - old male blue-roan cocker spaniel. Inoculated against rabies 4 months ago.	Off food. Eyes runny. Offensive discharge from prepuce which leaves spots of catarrh where dog sits down. Temperature varies from 101° F. to 102 5° F. during course of day. No D.D.T. being used.
	16.12.46		Still very poorly. No appetite. Condition low. Animal sleeps most of the time.
	17.12.46		Vomits yellow bile. Urine deep yellow colour. Pants a lot. Gums getting anæmic. Municipality sprayed drains recently to keep down an increase of flies in the area. Owner will verify if D.D.T. was used in place of pyrethrins.
	19.12.46		Temperature 104° F. Dog very listless. Gums anæmic. 15% D.D.T. with pyrethrins being used now by municipality.
	21.12.46		Very much better to-day. Gums getting redder. Full of life.
27	17.12.46	"Binkie," female cross-bred retriever. One year old.	Two weeks ago this dog was dusted with a 5% D.D.T. powder. Dog getting anæmic progressively. Came on heat two days ago and is getting worse, refusing food.
	21.12.46		Has improved remarkably.
28	14. 1.47	"Rajah," male 4-month-old brown and black cocker.	Every three to four days spits out a white froth. Appetite on and off on certain days not coincident with spitting. D.D.T. used on floors and walls.
	20. 1.47		No more odd symptoms. Dog better.

Objective symptoms	Treatment	Remarks
Temperature 106° F. Lungs clear. Gums anæmic. Fæces negative for helminth ova. Blood smears negative for piroplasms and filariæ.	2 grains Sodium cacodylate in 2 c.c. Nucleinic acid i/m. Sulfamerazine 1 with 50 mg. Nicotinamide 4 d.s.	
Temp. 103.5° F. Splenic enlargement.	Anthiomaline 2 c.c. i/m. Pills as before.	
Temperature 104° F. Gums anæmic. Very debilitated. No differentiation between gums and teeth. Breathing shallow. Prognosis unfavourable.	Pills as before. Tryparsamide 1 gm. in 6 c.c. i/m. Lactoflavin 20 mg. s/c. Stop all other drugs.	
Gums showing vestiges of colour.	Second injection as above of Lactoflavin.	Lactoflavin is capable of antidoting toxicity of metals like arsenic and antimony besides D.D.T. toxicity.
Weakness of legs. Temp. 102.2° F. Gums good.	Riboflavin 10 mg. s/c. Benerva compound pills 1 b.d.	
Slight catarrhal exudate from eyes. No discharge from nose. Temp. 103° F. Gums anæmic. Blood smears negative for piroplasmosis.	SUP 36 2 c.c. i/m.	Line of treatment for canine 'flu.
Temperature 101° F. Very listless. Fæces negative for ova.	Lactoflavin 10 mg. s/c. as a tonic.	
	Second dose ditto.	Probable that a latent tick-fever was made active by the Lactoflavin.
Blood smears positive piroplasmosis. No filariasis.	Phenamidine 5% 3.5 c.c. s/c. 1 aspirin t.i.d.	
	Brewers' yeast tablets 1 t.i.d.	
Temperature 101.2° F. Gums anæmic. Fæces negative for ova.	Riboflavin 10 mg. s/c.	
Anæmic. Temp. 101.6° F. Fæces negative for ova.	Riboflavin 10 mg. s/c.	

No.	Date	Subject	Subjective symptoms
29 & 30	24. 1.47	"Topsy," 1 - year - old female black and tan dachshund.	Off colour. Off food. Temperature 103° F.
		"Stormer," 3½-year-old Labrador.	Off food. Listless. Temperature 103.6° F. D.D.T. used very liberally as spray in the house where these dogs are living.
	25. 1.47	"Topsy."	Improved very much. Temperature down to 101.2° F.
		"Stormer."	No improvement. Temperature still up at 103.8° F.
	27. 1.47	"Topsy."	Improved remarkably. Normal dog. No fussiness over food.
		"Stormer."	Temperature normal. Heaps better. Eats very well.
31	10. 3.47	"Susan," 4 - year - old female white bull terrier.	No previous history of distemper. Fits coming on occasionally for the past three weeks. The dog froths at the mouth, gnashes teeth, back held rigid, occasionally falls down, eyes staring straight into nothingness. White bread has been major carbohydrate ration. To-day animal has had three fits up to now. D.D.T. has been used every day in the house.
	12. 3.47		Symptoms all cleared up except that dog still appears to stare into nothingness. Neck appears stiff.
	19. 3.47		All symptoms cleared up beautifully.
32	14. 3.47	"Terry," 1¼ - year - old male brown and white smooth fox terrier.	Vomited a lot of yellow froth. Listless. Off food. Small, hard motions several times a day. Temperature 100° F. D.D.T. liberally sprayed in house.
	19. 3.47		Better next day. Owner delayed reporting to see if cure was temporary. Getting on fine.
33	20. 3.47	"Raja," 2-year-old male red setter.	Half an hour after eating food it vomits all that it ate; during the last 15 days this has been a daily occurrence. Animal getting progressively thinner. Gums anæmic. Mouth appears boiled in appearance and there is persistent slobbering and salivation. Temperature has been 101° F. throughout this time. D.D.T. is being used on dog and in house.
	21. 3.47		Telephone report vomiting and salivation stopped.
	24. 4.47		Sudden recrudescence of symptoms although all D.D.T. has been removed from the house.
	26. 4.47		Vomiting has stopped and dog is picking up nicely.

Objective symptoms	Treatment	Remarks
Blood smears positive both dogs for piroplasmosis. Fæces negative for all ova.	Phenamidine 5%. "Topsy" 2 c.c. s/c., "Stormer" 6 c.c. s/c. By mouth aspirin 1, sulfadiazine 0.5 g. 1 and Nicotinic acid 50 mg. 1.	Of this combination "Topsy" b.d., "Stormer" 4 d.s.
	"Topsy" 10 mg. and "Stormer" 20 mg. of Lactoflavin s/c. No other drugs on either dog.	
Pupils of eyes widely dilated. Neck held very stiff. Gums fair. No temperature.	Lactoflavin 10 mg. s/c. Benerva compound 1 b.d.	
	Carry on same line of treatment by mouth.	
Temperature 100.2° F.	Lactoflavin 10 m.g. s/c.	
Temperature 101.2° F. Gums and tongue slightly swollen and covered with semi-tenacious saliva which hangs as strings across commissures of mouth. Dog has been regularly inoculated from six months of age with anti-rabies yearly. Very thin and emaciated.	Lactoflavin 4.4 c.c. (20 mg.) i/m. Clean out mouth and tongue with an eighth section of lemon or acid orange thrice daily.	
Dog was given a bath for the first time after it got ill. Symptoms came on five hours after this.	Lactoflavin 20 mg. s/c. Acid Hydrochlor. dil. 10 m. post cibus.	Bathing seems to bring on symptoms.

No.	Date	Subject	Subjective symptoms
34	21. 3.47	"Duke," male Alsatian, 4 years old.	Maniacal howling for the last five days, suddenly and for no apparent reason. Periods of lucidity when dog is quite normal and bright. Diet of white bread, meat, fish, eggs, etc., given but staple diet for the past four months, as a carbohydrate, has been white bread. D.D.T. was used on this dog because it was covered with ticks two days before symptoms started.
	23. 3.47		Dog in coma since last noon. For 24 hours after injection dog was perfectly normal without any of the maniacal howling. Dog was given a bath in cold water (room temperature) to wash off the D.D.T. Within three hours of the bath fell into a coma. Died seven hours after the bath. No autopsy done but head sent to the Bacteriological Institute.
	30. 3.47		Owner informs that it was negative for rabies, yet as a precautionary measure he is going through a course of injections.
35	7. 4.47	"Henry," male 5-months-old black and tan Dachshund.	Is having fits almost hourly. Dog very exhausted. Gums very anæmic. Not taking any nourishment. D.D.T. was used on dog two days previous.
	8. 4.47		Dog died. Owner refuses autopsy.

D.D.T. vaseline ointment in curing follicular mange in 10 to 15 days by daily application, or in 20 days by alternate day applications. However, he warns against the use of it on very extensive raw, braided areas.

(4) With success D.D.T. has been used as a spray to control the tse-tse fly menace in the fly-belts of Africa, according to du Toit, in *Nature*, October 11, 1947.

(5) G. Amdee, writing in *Readers Digest*, June, 1948, mentions the spectacular results that have been obtained by spraying cattle with D.D.T.—25 per cent increase in milk production, 32 per cent increase in weight, as against those unsprayed. Caution against promiscuous usage is emphasised. The balance of nature may be upset by the indiscriminate destruction of honey bees and birds in spraying crops and fields, and, in the case of farm spraying, the need of careful protection of feed troughs and drinking bowls is advocated. Special warning against the use of D.D.T. in oil on cattle is stressed, as the agent penetrates the skin, causing poisoning. Cats are singled out as being very unsuitable subjects for D.D.T. spraying, because of their cleaning habits.

(6) It has been used very effectively in destroying plague fleas.

(7) By employing aerosols or fine fogs of D.D.T. it is possible to kill mosquitoes and black flies which are susceptible to D.D.T., whilst birds, fish, bees and other forms of animal life are left unharmed, according to La Mer, of Columbia University, in *Science News Letter*, May 1, 1948.

Objective symptoms	Treatment	Remarks
Temperature 100.8° F. Gums good. Appears slightly excited but makes no effort to bite anyone, and allows easy examination. Had a semi-barking howl while it was waiting to come in for examination.	Lactoflavin 20 mg. s/c. Morphia ¾ grain s/c. Vomits within 20 minutes of injection.	
Breathing stertorious. Temperature 101° F. Gums very anæmic.	Strychnine 1/250 grain s/c.	Suspecting delayed morphinism.
		Bathing brings on symptoms.
Smears only are done and no animal inoculations at the Bact. Institute. Hence the usual advice to take Pasteur treatment even when negative.		
Senses lost during fits. Fæces positive for ancylostome ova.	Riboflavin 10 mg. s/c. Gardenal ½ gr. twice daily.	

Because of the toxicity of this insecticide, newer and safer agents have been evolved for its use on animals, such as D.F.D.T., or difluoro-diphenyl-trichloroethane, methoxychlor or p-methoxyphenyl-trichloroethane, lindane, and chlordane, according to the Bureau of Entomology and Plant Quarantine Annual Report, 1949. These compounds had to be evolved because insects have gained a tolerance to D.D.T. In *Science News Letter,* April 9, 1949, it is said that D.D.T. has no poisonous action on insects' hearts, and according to Hurst, of Cambridge (*Nature*, February 19, 1949), the ability of D.D.T. to paralyse and kill insects depends on its solubility in the lipides and fat-like substances of the insect's skin or cuticle.

The *Journal of the American Medical Association,* February 14, 1948, records the third death by D.D.T. poisoning in a 58-year-old labourer, who accidentally drank 4 ozs. of 5 per cent solution of D.D.T. Post-mortem showed kidney and liver damage, because it was the first case of a man who lived long enough to suffer changes in the internal organs, the findings confirming those autopsy lesions seen earlier on laboratory test animals. Case No. 1 in the record of cases shows the lesions in the liver encountered 7 months after the dog had apparently recovered from D.D.T. poisoning.

The Record of Cases. Because of the increasing use of D.D.T. there is need for the use of a quick and powerful antidote, in those animals that are susceptible to its toxicity. The writer has observed that whereas 10 dogs may

be treated for vermin infestations, it is usually one or two that go down with symptoms. Cases Nos. 16, 17 and 18, however, all belonged to one owner, and it is probable that a hypovitaminosis B-complex, or particularly an ariboflavinosis, due to faulty feeding, requires further probing into, in relation to D.D.T. toxicity. Bathing a dog that had been treated with D.D.T. seemed to bring on recrudescence of symptoms in cases Nos. 33 and 34. Latent infections were fulminated in cases Nos. 7, 8 and 26. In the dry zones of Ceylon there have been no cases reported of poisoning, due probably to lack of proper veterinary diagnosis, absence of absorption due to aridity, lack of interest in animals and their ailments; but in Colombo, the capital city of Ceylon, where there is a fair number of veterinarians, the extrinsic factors of an average relative humidity by day of 74 per cent, and by night of 90 per cent, seem to have some bearing on the numbers of cases encountered (average monthly mean temperature is 80.5 degrees F.). It must also be stated that diseases like rabies, distemper (Stuttgart or canine typhus, piroplasmosis, etc., are endemic in Ceylon, and necessarily confuse the evaluation of the serviceability of the antidote under test. Whether D.D.T. induces an ariboflavinosis will be continued in further investigations, all previous work having been done as therapeutics by a private practitioner.

THE ADRENALS OF THE CAMEL

By N. GEORGE, D.V.M.,

Assistant Professor of Anatomy, Faculty of Veterinary Medicine, Fouad I. University, Giza, Cairo.

Our knowledge about the anatomy of the adrenal glands in the camel, one of the most important domesticated animals in Egypt, is still insufficient. Not only do we not know anything about the very important problem of the effect of domestication on these glands, but al so the opinions are divided among the anatomists as to their shape and position.

According to Lesbre (1903), the glands in question are smaller than those of cattle, whilst Leese (1927) records that the left adrenal is situated 2 to 3 inches in front of the left kidney. This difference in shape and position has also been corroborated by the recent studies of Tayeb (1948), to whom, however, we owe, for the first time, the measurement and weight of these glands.

In the course of my duties in inspecting the meat of camels, I had the opportunity of examining the adrenals in a few camels, the results of which are given below in the hope that they will be of some interest to the anatomists.

Our studies were carried out on 15 Sudanese camels (7 ♂ + 8 ♀) of different ages, selected from the abattoir at Cairo, the age, the sex and the weight of which were known. Of these, only three were dissected in the Anatomy Department of the Faculty, after injecting them with a solution consisting of formalin, glycerine, carbolic acid and blue.

On examination, it was found that the adrenal glands are subject to variations in shape and position. This has been noted by the previous workers.

XUM

The right adrenal is an elongated, flattened organ, triangular shaped in form, and covered with a strong capsule. It is greyish-pink in colour. Its average length, width and thickness are as follows: 5-8 cm.; 3-5 cm.; 1-5 cm. It lies opposite the intercostal space at the proximal end of the last two ribs, concealed in a fossa of the right crus of the diaphragm, with an upward and forward direction. It is thick in the centre.

It presents two surfaces, two borders, and two extremities, cranial and caudal. Its medial surface is flattened and is related to the right crus of the diaphragm and to the posterior vena cava. Its lateral surface is related to the anterior extremity of the right kidney. The anterior extremity is broader than the posterior; it has a marked convex margin and is concealed in the renal impression of the liver, to which, however, it is intimately attached by a strong fold of peritoneum. Its dorsal border is somewhat convex and is attached to the right crus of the diaphragm by a strong, short peritoneal ligament. Its ventral border is nearly straight and is covered by the right lateral ligament of the liver.

The left organ is also a flattened organ, but, unlike the right, it is discoidal in shape and covered with a thin capsule. It average length, width and thickness are: 4 cm.; 3.5 cm.; and about 2 cm. (in the centre). It lies opposite the ventral aspect of the transverse process of the first and second lumbar vertebræ and 8 to 10 cm. forward and inward from the anterior pole of the left kidney. It presents two surfaces. Its medial surface rests on a cushion of fatty tissue containing the renal vein and the posterior aorta. Its lateral surface is related to the pancreas, the dorsal extremity of the spleen (head), and to the fatty tissue surrounding the vessels and nerves of the latter. Its ventral border is nearly straight and is in contact with the left renal vein. It is attached to the transverse process of the second lumbar vertebra by a thin, flattened, small ligament. Its anterior extremity is somewhat narrow, whilst the posterior is about twice as wide as the anterior.

It is to be noted that after removal from its surrounding tissue, the surface of the capsule (of both the adrenals) appears to be smooth, with a small hilus on the ventral edge.

Vessels

It was found on examination of two camels that the adrenals receive their blood supply from the aorta, with this difference, that in the case of the right adrenal there was no branch from the right renal artery (for instance, as in the horse), whilst in the left there was a branch from the left renal artery.

Table showing the sex, age and weight of animals in relation to weight of the adrenal glands.

	Sex	Age	Body-weight (alive) K.	R.A. grm.	L.A. grm.	Total weight of Adrenals grm.
1	M	5	270	17	17	34
2	M	5	265	15	11	26
3	M	10	465	22	19	41
4	M	Aged*	310	17	17	34

XUM

Table showing the sex, age and weight of animals in relation to weight of the adrenal glands

	Sex	Age	Body-weight (alive) K.	R.A. grm.	L.A. grm.	Total weight of Adrenals grm.
5	M	Aged	400	21	20	41
6	M	Aged	478	16.5	15	31.5
7	M	Aged	470	24	22.5	46.5
8	F	6	265	23	19	42
9	F	6	435	32	27	59
3	F	Aged	395	31	33.5	64.5
4	F	Aged	255	37	27.5	64.5
5	F	Aged	414	29	29	58
6	F	Aged	343	18	16	34
7	F	Aged	305	16	15	31
8	F	Aged	390	30	29	59

* Aged means over eleven years.

Average weights related to total body-weight.

Male—	Right adrenal ...	18.9 grm.	0.047%	of body-weight
	Left adrenal ...	17.35 grm.	0.043%	„ „
Female—	Right adrenal ...	27 grm.	0.076%	„ „
	Left adrenal ...	24.5 grm.	0.069%	„ „

Summary and Conclusion

Studies were made on the adrenal glands of 15 Sudanese camels (7 ♂ + 8 ♀). From the small number of specimens examined, it appears that in young camels under 6 years of age these glands are small, with smooth surfaces, and are red-brown in colour. They became considerably bigger after that age and their surfaces appear more irregular.

These glands are heavier in the females than in the males.

Acknowledgments

I would like to express my deep debt of gratitude to Dr. S. Fouad, Dean of the Faculty of Veterinary Medicine. My thanks are due to the Director of the Abattoir, Cairo, for the materials, and Dr. Hagazi, of the Anatomy Department, for his technical help and criticism.

REFERENCES

Leese, A.: "A Treatise on the One-humped Camel." Stanford (Lincolnshire). Haynes & Sons, 1927, p. 37.

Tayeb, M. A. F.: "Urinary System of the Camel." *Journal of American Veterinary Medical Association*, 113: 568-572, December, 1948.

XUM

ABSTRACT OF CURRENT LITERATURE

Archivio Veterinario Italiano. Vol. 1, No.3, 1950. In Italian.

This records several experimental works.

(1) Experiment conducted at Milan University under the direction of Professor D. D. Nai, by Giovanni Giolitti.

By inoculating 8 - 11 day old puppies with Foot and Mouth virus death occurred in 48 hours. Microscopic myocardial changes were observed as white or whitish yellow spots, which microscopically were shown to be regressive. In view of bacteriological examination of these lesions proving negative except in one case, it is alleged that these cardiac lesions are the result of the foot and mouth virus.

It was observed that sulphonamides had no effect on the development of these myocardial lesions.

(2) Experiment by Pietro Agrimi at Lab. Provinciale D'Igiene e Profilassi di Massa Carrara.

Normal glycæmia is observed in 94 healthy bovines aged up to 7 years.

Normal said to vary from 35 to 125 mg. per cent. From this the following averages were devolved.

Females (65)	70.55	—	1.98
Males (29)	89.90	—	2.22

It appears that glycæmia decreases with age.

From Pathology Institute, Bologna University.

Director L. Montroni.

Describes lesions found in ten swine that died of Teschen disease. They divided themselves into two groups: one group showed œdematous changes in gut and their lymph nodes with degenerative changes in CNS. The other group showed inflammatory lesions of meninges (cerebral) and to a lesser degree those of the cord and of the cord itself.

From Pemgia University.

Bruno Baldelli and Valentino Romanelli.

In experiments on guinea pigs affected by spontaneous sarcoptic mange, the authors observed the histamine rate in the blood always exceeds twice normal, and in lesions is half normal.

Finally, recent publications are reviewed.

REVIEWS

THE ART OF SCIENTIFIC INVESTIGATION, by W. I. B. Beveridge. London: Wm. Heinemann. Price 10s. 6d.

PROFESSOR BEVERIDGE is a brave man to set out his thoughts on "The Art of Scientific Investigation" in plain black and white. I admire a brave man and I have read every page of this book, including his preface, with deep interest. I am sure that others will do the same for the subject matter is one

of vital importance. Can one orientate scientific research work on fixed or even semi-fixed lines of approach? Can one assess if a young man or woman, no matter how brilliant has been their previous record, will be other than a " Hewer of wood and a drawer of water " when they turn their attention to research in an endeavour to discover new things or reveal what was obscure? I have grave doubts. A research worker is an explorer; he must have faith in himself and be somewhat of a missionary. He will probe the unknown, but generally it remains for those of a more static calibre to follow and stabilise. If the essentials required of scientific research could be levelled down to a systematic affair, then surely we would be in Utopia by this time as a result of the information contained in the 36,000 scientific periodicals and the 20,000 scientific articles which see the light of day each week.

If a young worker could read even a tithe of the material which might refer to his own particular line of country would he gain a relative amount of benefit? It may be that he would be confused and confounded. Many of the articles in this spate of manuscript are of no great consequence; they are of the nature of " pot boilers " produced as evidence that something has been done. Reprints are an attraction, for they can be distributed far and wide or they may be collected as a squirrel stores its nuts against that rainy day when progression may depend upon an answer to the question, " What publications have you made?"

A good research worker has to possess or acquire the attributes of a successful inventor or explorer. He must be moved by an inward urge towards his work. He must be self-reliant, for he will have to face the obliquity and ridicule of his fellows if he should stray from the orthodox path. He must be inquisitive. He must have eyes that can encompass a wide circle and even see round a corner. He must have hands that can feel and work to his bidding. He must be something of a dreamer. Such a man needs no regimented training; in fact, subject him to orthodox direction and you will stultify his mind. Leave him to his musings and his dreams and the chances are that he will produce something worth while. Regiment or direct his life and the result will be frustration or at the best he will grade down to the level of the drones. Regimentation will produce many diligent workers, but it will not make a " star." The modern tendency to create large elaborately equipped government or foundation subsidised research institutes has already shown what may happen when one tries to produce research workers by vote. Research means adventure and calls for a different temperament than that which is attracted by convictions of service, i.e. regular hours, leisure, and progressive and safe emoluments. Most of the great discoveries have been made by men who had none of these modern advantages. They entered the life compelled by an inward urge which would take no account of mundane things and they were stimulated by, and flourished in, adversity. Professor Beveridge has set down in eleven chapters his thoughts on " The Art of Scientific Investigation " and one is able to follow him in good logical sequence. I believe that his ideas are not entirely divorced from mine. It may be that this is the reason why I just had to read on until I had finished the book. I wish he had not headed Chapter II

"Chance," for I doubt if this is a true interpretation of those great occasions when the horizon becomes clear almost in a flash. Circumstances may be propitious, but if a man has the genius to recognise the opportunity which is suddenly revealed and takes advantage of it, well that is not exactly chance. Let us leave that term to those who carry a rabbit's foot or spend their time on a football pool coupon.

I am glad that Professor Beveridge has produced this book. Someone had to do it at some time and the task could not have been in better hands. I would commend the book in particular to those young people who are thinking of a life in research and I would draw their attention to Chapter eleven. If the lessons of this chapter sink in it will deter those who are just thinking in terms of a job at which they can earn a living, and there are far too many of this ilk, but I am sure it will stimulate and encourage those who are impelled by a true vocational call. This book should have a wide appeal and it will be read with interest and understanding by the tyro, the man of renown or even the ordinary layman. It is full of anecdotes of the lives and discoveries of those who are high on the role of fame, past and present, and there are photographs of many of these great men.

It is a book to which one can turn from time to time as a source of inspiration.

BEGINNERS ON HORSEBACK, by Major D. MacL. Macmillan. London: Constable & Co., Ltd. Price 12s. 6d.

THE future of the horse depends greatly upon the continued interest of the ordinary people in this animal as a means of recreation and in sport, for the day when he is an economic necessity in transport and on the farm seems to be passing away.

What this future will be depends upon our children. Will they interest themselves sufficiently, or can we induce them to cultivate such an interest so that the new generation will be as horse-conscious and knowledgable as their parents were in their time?

The pony club is one part of the answer. Now, the object of a pony club is not only to encourage the delights of riding as a form of recreation, but also to attempt to make the members reasonably competent horse-masters and horse-lovers. Anyone who has interested himself in a pony club must be very conscious of the tremendous appetite for horse "knowledge" displayed by the children, and how they will sit around you patiently for hours on end as long as you care to talk or demonstrate on any matters to do with horses, horse-mastership or equitation.

There are tests which they can attempt, and their pride on passing these marks of knowledge and efficiency is good to behold.

This urge for horse knowledge has led to a spate of books. I know one small girl who posseses a library of over fifty tomes. But one book has been missing. It is a book which will review the whole subject in simple language such as a child can read and understand, a book which can guide him, or her, in preparation for the pony club tests, a book which will serve right from start

XUM

to finish, and yet can be accommodated in the side pocket of a child's hacking coat. Major MacMillan has produced such a text-book, and under the sub-titles, "Part I: Elementary Equitation," and "Part II: Elementary Horse-mastership," any child, or, indeed, any beginner, no matter of what age they be, will find a fount of knowledge. There are many excellent illustrations, all very much to the point, and the glossary of "horsey" terms to be found in "Appendix C" will prove very useful to all those who like to talk in horsey language amongst their fellows.

LET'S GO HUNTING, by B. L. Kearley. Illustrations by Graham Smith. Foreword by the Duke of Beaufort, K.G., M.F.H. London: Ernest Benn, Ltd. Price 12s. 6d.

THIS is at once a good story book and a good text-book. The art of imparting knowledge is best served by those who can make their subject matter really interesting, and B. L. Kearley seems to be an accomplished teacher. The hero of the story is a Mr. Wisp, a horse dealer and riding master; his pupils who he introduces to the hunting field are two young people, brother and sister, Jane and John. Mr. Wisp is what we would all like to be, a real horseman, not only in his physical appearance, but also in his undoubted knowledge of horses, hounds, the countryside, and its people. In many ways his methods of instruction resemble that of the father in the "Swiss Family Robinson," for almost every remark that he makes contains some item of vital instruction on horsemanship, horses, hounds, or of the countryside and hunting etiquette. He does not ram information down one's throat, but rather his method is one which incites interest and gives an appetite for more. He can see the other fellow's point of view, and whilst obviously he is all for hunting, his argument is so subtle and correct that I doubt if even an anti-hunter could take objection. Indeed, it is possible that some may be converted.

I think that there is no doubt that even a tyro horseman who read this book and imbibed its lessons could attempt his first day with hounds with some degree of confidence. He would certainly not offend against the rules.

There is no doubt, also, that there are many to whom a day with hounds is no novelty who could profit much.

Quite apart from its instructional value, it is a good story, and it will hold the reader's attention from start to finish.

Publishers' Notices

THE BRITISH VETERINARY JOURNAL, with which is incorporated THE VETERINARY JOURNAL, is published monthly, and copy for advertisements should be in the hands of the publishers—Baillière, Tindall and Cox—not later than the 20th of the preceding month, if proof is required. Tel.: Temple Bar 3386.

Letters for the Journal, literary contributions, reports, notices, books for review, exchanges, new instruments or materials, and all matter for publication (except advertisements) should be addressed to the Editor.

Annual Subscription, 40s. ($6.50 U.S.A. currency, post free.)